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WITH GLYCERINE FROM FIBER TO FABRIC—PART II*

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APPLICATIONS (cont)

C. Resin Finishes

Modern textile finishing benefits greatly from the use of resins, particularly of the alkyd type. Alkyds are condensation products of a polybasic alcohol and a polycarboxylic acid, most often glycerine and phthalic acid or anhydride. Maleic, sebacic, and succinic are some of the other acids used *(17)*.

The glyceryl phthalate resins employed in textile finishing are usually polymerized. Because of their trifunctionality, they can polymerize in three dimensions. They are water insoluble and therefore applicable only by means of organic solvents or in the form of aqueous emulsions, which are heat-cured to yield insoluble, infusible materials, called "heat-convertible resins" (37). However, aqueous solutions or dispersions of modified alkyds may be prepared and are very useful in certain applications *(18, 32, 60)*.

Alkyd resins are seldom used alone. More often they are combined with suitable modifiers, such as various oils, usually of the nondrying type *(37)*, with fatty acids from oils, with natural or synthetic resins, and with other substances *(17, 74)*. They may also be used to plasticize or otherwise modify different types of finishes, such as urea-formaldehyde or melamine resins and cellulosic derivatives *(62)*.

An incredibly wide variety of effects may be achieved by the application of resin finishes. Thus, R M Fischer *(75)* cites "shrinkage control and better launderability, slippage control, durable crisp hand, stretch control, crease resistance, better resistance to soiling and remarkable lightfastness . . ." as properties obtainable by treating sheer fabrics with a combination of melamine and alkyd resins *(41)*. In addition, alkyd resins are responsible for numerous finishes and protective coatings that increase fabric resistance to flame, water, and poison gas; that change the hand or appearance of textiles, such as water-soluble alkyds used to give a woolen feel to cotton or rayon *(17)* or coatings to produce fabric transparency; and that act as vehicles for the incorporation of fungicides *(41)* and antimildew compositions *(12)*. The properties of alkyd resins that render them so valuable in these uses have been carefully tabulated by J B Cleaveland *(17, 76, 77)*. An earlier article, by D H Powers *(78)*, stresses ease of application, permanency, and washfastness. In addition, Powers states that fabrics made from vegetable, animal, or man-made fibers may be increased in weight by one to 20% by the use of one or several resins *(17)*.

Other important textile uses of alkyd resins depend on their adhesive and pigment-binding properties. The latter will be discussed under "DYEING AND PRINTING." Several patents also recommend the use of alkyd resins in the preparation of textiles, eg, as sizing agents. Heterogeneous resins of complex composition and containing glycerine may be used to make resin-bonded glass-fiber mats *(79, 80)*.

Ester gums also deserve special mention as glycerine-containing resins which find considerable use in textile finishing. They are essentially reaction products of glycerine and natural resins, and may be employed to provide both permanent and flexible textile finishes *(18)*, such as finishes to increase water repellency (U S 2,261,091) or the body and stiffness of fabrics (Brit 535,261). A recent article describes the reaction between rosin and glycerine with a view to facilitating manufacturing techniques and to obtaining ester gums of better quality *(81)*.

SIZING———Although the use of glycerine-containing resins in fabric sizes is far less extensive than their use in special finishes, a continuing flow of patents over a period of more than 20 years indicates steady and widespread interest in this application. In 1935, for instance, a German patent (616,895) disclosed the composition of a size based on the reaction of glycerine and phthalic anhydride, cocoanut-oil fatty acids, and stearic acid. In 1936, a French patent (795,414) specified a size made from glycerine-phthalic acid resin, carbamide, and water. The following year, another (Fr 812,662) recommended glycerine-abietic acid resin dissolved in benzene or trichloroethane for the sizing of threads *(43)*. German patent 652,362, issued a few months later, advocated glycerine-containing resins in aqueous solutions of urea as a means of sizing rayon and other fabrics *(33)*. Similarly, Brit 486,864 (1938) specified a thiourea derivative treated with a water-insoluble glyceryl phthalate resin for the sizing of fibrous materials *(46)*.

The use of glycitric resins, condensation products of glycerine and citric acid, as water-soluble binders, sizes, or finishing agents has been suggested by a Russian source *(33)*. In 1943 Canada granted a patent (409,907) for obtaining a starch-like finish through use of an alkyd resin modified with an alkyl-substituted or straight benzoic acid and applicable as an aqueous emulsion *(17)*. A method for replacing starch in the sizing of textile materials was published in 1947 in this country *(51)*. It was found that two percent styrene resin or three percent alkyd resin, in water-soluble form, could be substituted for five percent pearl corn starch. Furthermore, both resins showed promise as warp sizes. When combined with urea- or melamine-formaldehyde resins or with quaternary ammonium compounds, the resins could be used to impart durable finishes.

According to an interesting new process for degreasing, cleaning, and sizing carpets and other pile fabrics containing a large proportion of unscoured wool, a volatile grease solvent is applied to the fabric in order to remove grease and dirt. The fabric is then treated, while still wet, with a sizing agent soluble in the organic solvent used for cleaning and, finally, the solvent is removed. An example

*Note: For Part I see *Am Dyestuff Reptr* 46, No. 21, 761-9 (Oct 21, 1957).

of such a sizing agent is a trichloroethylene solution containing a mixture of 25% of a phenolic ester gum and 5% by weight of a chlorinated rubber with a chlorine content of 65%. Carpets finished in this fashion are claimed to be very clean and bright in color, and to exhibit stiffness and good anchorage of the pile *(82)*.

SPECIAL FINISHING —— Alkyds and similar resins in special fabric finishes and coatings are important to industry, the armed forces, and the general public. The following examples will illustrate the versatility of glycerine-containing resins as special finishing agents.

Flame Resistance. A flameproofing treatment that resists laundering was developed by the Department of Agriculture in 1946. It consists in applying an emulsion containing an alkyd resin to coveralls and other protective cotton garments which are worn at work *(47)*. A coating for canvas tent cloth designed especially to meet requirements of the Military Planning Board was also developed. This alkyd resin is modified with unsaturated fatty acids. It renders the fabric waterproof and fungus-resistant, besides leaving it flexible even at subzero temperatures *(12)*. Other alkyds have been described for increasing the wear of asbestos garments. A stable emulsion of the oil-in-water type simultaneously deposits on textile fabrics "mildewproofing, fire-resisting, afterglow preventing, coloring, and binding materials" *(12)*. Other, earlier cases of flame-resistant finishing with alkyds are known. G Leffingwell, for instance, reported twenty years ago on the coating of threads and fabrics with glyceryl phthalate resins to impart flame resistance as well as water repellency *(39)*. Brit 504,480 (1939) also covered resins made with glycerine for use in fireproofing fabrics *(33)*. A more recent formulation was the object of a Japanese patent, according to which a condensate of

	parts
tetrachlorophthalic acid-glycerine resin	100
chlorinated rubber	100
chlorinated paraffin or paraffin	50

in 2000 parts of trichloroethylene is suspended with 70 parts of SbO (authors' note: probably SnO). The fabric is dipped into this preparation for five minutes, dried at 60 to 70° C, and heat-treated at 110°C *(83)*.

Fluid Impermeability. The literature reveals an impressive array of fluid-impervious resin coatings for impregnating raincoats, tarpaulins, varnished cambric, wound dressings, silk fabrics, and many other products. For example, a treatment for imparting water-resistant, oil-resistant, and dielectric properties to varnished cambric is based on the use of a modified glycerine-phthalic anhydride resin *(17, 43)*. A variation on this method employs a modified glycerine-phthalic anhydride-maleic anhydride resin for producing electrical insulation *(17, 26a)*.

Glyceryl sebacate alkyds are frequently used in coating compositions. For instance, flexible fabrics resistant to organic solvents and suitable for making fuel-pump diaphragms may be obtained by coating with an alkyd resin made from sebacic and citric acids and glycerine (Fr 837,267; U S 2,235,872). Five to 20% lampblack is added to this formulation to prevent solubility and scuffing off *(17, 32, 44)*. A condensate of sebacic or succinic acid and glycerine (U S 2,469,348) may be incorporated into coating compositions to impart water repellency to light-weight fabrics *(41)*. Glyceryl sebacate used in conjunction with cellulose nitrate, butyl acetylricinoleate, a solvent, and comminuted mica yields a waterproofing lacquer for silk fabrics (U S 2,202,-254). This composition illustrates the application of alkyd resins by means of organic solvents *(32)*.

A mixture containing a fatty lacquer and a dried, oil-modified glyceryl phthalate resin, (Ger 642,938) yields a transparent, elastic coating suitable for making oil cloth *(43)*. A rayon fabric waterproofed with an alkyd-resin coating was described, in the British Pharmaceutical Codex during World War II, as a substitute for oiled silk in the dressing of wounds *(62, 76)*. According to P B Law, oiled-silk substitutes made with alkyd resins form clear and colorless films that do not yellow on aging and that are free from a disagreeable odor *(84)*.

Alkyd resins based on linseed oil and various polyalcohols were comparison-tested in the laboratory by immersion of the dried resin films on steel panels in cold and hot water and in alkaline soap solutions. Resins having a high content of linseed oil (above 50%) and a low acid number showed the highest degree of water resistance. Adequate cross-linking and the presence of a minimum number of free hydroxyl groups are other requirements for good water resistance *(85)*.

Durable water-repellent finishes may be produced by impregnating fabrics with combinations of polyhydric alcohol-fatty acid esters and titanium salts (US 2,505,259), eg, glyceryl monostearate and titanium sulfate *(41)*. High water and wear resistance may be achieved by the use of compositions (US 2,485,327) containing an ester gum *(41)*.

Launderability. An alkyd-resin emulsion (US 2,376,595) is employed as a laundry-resistant finish for stiffening cloth and for giving it a fuller hand *(47)*. Retention of the sizing on laundering and a full, crisp hand are obtainable on a variety of fabrics (US 2,370,362) by the application of resin emulsions containing urea- or melamine-formaldehyde resins and alkyds of the glyceryl phthalate type *(27, 47)*. Similarly, patents disclose the use of such emulsions in wash-resistant coatings that provide a glazed-chintz effect *(17, 76)*. Alkyds may act as plasticizers in this application *(62)*.

Transparency. Alkyd resins, such as polyesters of glycerine, phthalic anhydride, and sebacic acid, modified with a nondrying oil, are important ingredients of protective coatings (US 2,150,301) used to produce weather-resistant, transparent cotton netting *(17, 46)*. Alkyds modified with nondrying or semidrying oils, combined with urea-formaldehyde condensates, may be used to make transparent, fluid-impermeable fabrics with higher gloss. This process is primarily applicable to dyed, undyed, or printed rayon or silk fabrics. It is said to offer several advantages, such as freedom from discoloration and tackiness when the goods are heat-treated for a short period of time. It also increases flexibility, eliminates cracking, and imparts a soft handle to the goods *(32)*. Two patents granted in 1949 (U S 2,466,066; Swiss 257,936) describe the use of compositions containing alkyds for making textiles transparent. Cotton, silk, wool, open-mesh regenerated cellulose, and nylon may be treated in this manner *(41)*.

Resistance to Poison Gas. Since glycerine alone will act as a barrier against mustard gas, it is not surprising that glycerine-containing alkyd resins have gas-resistant properties, useful in the production of fabrics for chemical-warfare purposes. This function of alkyds was pointed out by Cleaveland *(77)* and was soon described by other writers, too, such as J R Owens and W F Whitescarver *(12)*, who reported on the military use of alkyd coatings. Besides listing some military applications of oil-modified, gas-resistant alkyds, Owens described their adaptability to civilian use, including the production of many types of protective equipment and clothing. Whitescarver remarked that, of all the materials then available for replacing rubber, alkyd resins of the oxidizing type consistently proved the most resistant to mustard gas. Other types of alkyds

were usually added as plasticizers. Textiles thus treated with alkyd coatings apparently attain a high degree of flexibility and a lack of tackiness under extreme conditions of temperature *(60)*. A patent for making fabrics resistant to mustard gas (U S 2,481,532) covers modified glyceryl sebacate resins. The listing of suggested uses includes such items as shower curtains, raincoats, and cable wrappings *(12)*.

Wearability. Alkyd resins may be used to prolong the life of textile materials. For instance, sheer knit goods made from nylon yarn may be treated against snags and pulled threads (U S 2,289,222) by coating the yarn with a composition that contains a castor oil-modified glyceryl phthalate *(17)*. The same type of resin is employed for making bolt cloth, grit cloth, and similar nylon products (U S 2,360,245; Brit 557,486 to 557,488). It prevents slipping of the threads and increasing the wearability of the fabric *(50, 60)*. Resistance to heat, acid, and alkali may be produced by treating yarn or cloth with an aqueous solution of an alkyd resin made from glycerine, triethanolamine, and phthalic anhydride. This alkyd can be used alone or together with a water-soluble urea-formaldehyde resin *(60)*. Other modified alkyd resins serve to diminish abrasion and flexing (U S 2,502,353) in upholstery fabrics *(41)*, to improve the elasticity of textiles *(43)*, and to plasticize urea-formaldehyde resins (Brit 512,187) applied to textiles (32). Crease resistance may also be obtained with urea-formaldehyde resins condensed in the presence of several additives, including glycerine, whose purpose is to soften and protect the finished fabric *(46)*.

Miscellaneous Uses. A glyceryl phthalate resin may be used as the base of a varnish (Brit 495,158) for application to rubber-coated fabrics *(17, 46)* or may enter into compositions of thermoplastic cements (Brit 438,028) for applying decorations to fabric or for joining together several layers of cloth *(43)*. Alkyds are also mentioned as the plasticizing agents in resinous adhesives (U S 2,312,925) for bonding fabrics *(76)*. The manufacture of flocking cements (US 2,511,171) is yet another instance of the versatility of alkyds in the textile field *(41)*.

D. Dyeing and Printing

Glycerine finds application in many dyeing and printing procedures for textiles. It is a standard ingredient of many printing pastes and is often an important component of dyestuffs in paste form.

The reasons for the almost universal usefulness of glycerine are to be found once more in its unique combination of properties, particularly its hygroscopicity and solvent action. In addition, it serves as a suspending medium, thickener, dispersing agent, and penetrant *(75)*. Although many time-honored processes in the dyeing and printing of fabrics are still understood imperfectly with respect to the functions of individual ingredients and techniques, there is much practical evidence and the testimony of experts to confirm the benefits derived from the use of glycerine.

For example, glycerine produces dyestuff pastes of excellent workability, promotes the fixation of dyes in printing pastes, increases color value in printing, and assists in the retention of moisture in the ager. A 1950 report on vat-color printing also mentioned glycerine's softening and solvent properties and emphasized that the use of five to six percent of this product improves the fixation and color yield in vat printing *(8)*. According to another source, up to 10% glycerine may be used for this purpose *(12)*. In both vat dyeing and printing, reduction and solution take place in a glycerine vehicle *(86)*. Diserens assumes that glycerine improves the solubility of the leuco compound and thus facilitates the penetration and fixation of the dye. He reports that Ger 578,821 proposes the use of polyglycerol for this purpose *(87)*. In the screen printing of rayon, glycerine also aids in preventing viscous thickeners from clogging and drying the meshes of the screens; this danger is particularly evident in the type of printing tables that are heated from below *(88, 89)*.

Quinn has observed that the addition of glycerine and a trace of copper sulfate catalyst to Indigosol print pastes yields much fuller prints than are obtainable without these ingredients. Glycerine promotes better color yield and evenness, especially in the case of goods aged two or three times, when there is insufficient moisture in the steam fed to the ager *(90)*.

DYEING——The use of glycerine as a solvent and moistening agent in the finishing of commercial dyes goes back almost to the beginnings of the synthetic-dyestuff era, which began with Perkin's discovery of mauve in 1856 *(91)*. Today glycerine is still an ingredient of many dyestuffs shipped in paste form, since it prevents the dye from drying out and sticking to the sides of the drum. Its noncorrosiveness and low freezing point are desirable in this application. During dyeing, the water miscibility of the glycerine present in the dye paste and its solvent action on many types of dyestuffs aid in dispersing the latter in the dyebath, whereby the high boiling point of glycerine is of advantage. As a result of its strong affinity for textile fibers, glycerine also serves as a dye-leveling agent *(20)*.

In regard to the solubilizing effect of glycerine on a variety of dyestuffs, the following paragraphs will provide examples, including the use of glycerine with acid and vat dyes. In addition, this product will dissolve many basic dyes, especially Rhodamine dyestuffs, as well as mordant dyes. When certain alcohol-insoluble dyestuffs are first dissolved in glycerine, they become readily miscible with alcohol *(92)*.

Occasionally glycerine is added directly to the dyebath. This was the case with the revised nylon-dyeing formulas especially developed by the Nylon Task Committee during the war to meet the washfastness and other requirements of the Quartermaster Corps. These nylon-padding formulas were based on acid dyes and contained appreciable quantities of glycerine and small amounts of shellac and ammonia water *(12, 40)*.

A 1952 US patent *(93)* describes a dyebath prepared from 0.5% water-dispersed pigment, 0.235% (hydroxyethyl) cellulose, 0.025% cationic dispersant, 3.25% of a glycerine-containing, cationic, triethanolamine-modified resin, and water to make up 100%. The resin is composed of

	grams
melamine	840
triethanolamine	2333
glycerine	1836
37.1% formaldehyde	3074
95% paraformaldehyde	1200

and sufficient 32% hydrochloric acid to obtain a pH of 1.5 ± 0.2. The fabric to be dyed is immersed in this bath, squeezed, and cured at 250 to 300° F. The patent claims that the resultant colorings have excellent resistance to crocking, scrubbing, and drycleaning fluids.

In naphthol dyeing, glycerine is sometimes used before coupling to improve the stability of the naphthol solution. This solution contains the naphthol component, caustic soda, and sulfated castor oil or a similar surfactant *(37)*.

Other dyeing procedures in which glycerine finds application include the vat dyeing of acetate fabrics *(35)*, the dyeing of cottons with direct colors *(35)*, and the preparation of dyeing compounds for use on wool, silk, cotton, synthetic fibers, and, particularly, rayon and staple fibers made from cellulose *(20, 43)*. Spray-

dyeing processes frequently utilize glycerine as a solvent, dispersant, and suspending agent for dyes or pigments. The nonfoaming characteristics of the resulting compositions promote even dyeing. It may also be employed for producing blended tints, or "umbray" effects *(20)*. Patents describing the spray dyeing of rayon [US 2,295,429 (1942); Can 406,416 (1942)] claim that the use of glycerine increases the weight without reducing the luster of the fabric *(20)*. The same effect was previously described by Caystor in an article on the spray dyeing of both silk and rayon fabrics *(94)*. A patent covering the fugitive tinting of nylon fibers or of nylon-wool mixtures with an aqueous, alkaline solution of a barium salt of phenolphthalein, thymophthalein, or o-cresolphthalein suggests the use of glycerine or ethylene glycol as a humectant that will not react with either the phthalein salt or the textile. The humectant is said to prolong considerably the period of color retention *(95)*.

Examples of Soviet methods involving glycerine include a procedure for vat-dyeing linen yarn on a modified Essertype apparatus, in which vat dye in powder form is pasted before use with about 30% as much glycerine as dye *(96)*. A suspension technique is then used for vat-dyeing semiflax linen fabrics with a suspension containing equal proportions of dye and glycerine. This technique produces full, level colors when the quantities of dye and hydrosulfite ($Na_2S_2O_4$) used are the same as are used in vat dyeing, and provided the fabric to be dyed is smooth and of good capillarity *(97)*. One to 1.5% glycerine was employed in a process for the dyeing of mixed fabrics, eg, material containing 15% cuprammonium fiber and 50% mestizo wool, whereby the rayon fiber dyed evenly throughout the textile and the finished material looked soft and elastic *(98)*.

Fluid-Bed Dyeing. Glycerine has also been used successfully in the dyeing of textiles by means of an entirely new and promising British technique for the dyeing and drying of heavy and medium-weight fabrics, and for the heat setting of resin finishes *(99, 100)*. This procedure may be applied to effect great savings in both time and cost. It has the additional advantage—since fabrics may be treated on both sides simultaneously—of preventing uneven drying and the migration of color or of resin in the dyeing of fabrics or the baking of crease-resistant finishes, respectively. The method is based on the use of fluid beds, a type of equipment just recently adapted to textile applications, although similar machinery has been employed in oil cracking for the past fifteen years.

Essentially, a fluid bed is a drum filled with tiny glass beads or grains of sand (the model made and tested by British Tufting Machinery, Ltd, at Blackburn, England, holds one ton of glass beads). As the fabric is passed through the drum, this fluidizing substance is agitated by large quantities of air introduced at low pressure into the bottom of the drum. The movement of the small solid particles distributes the heat from steam pipes within the drum so that drying, for example, proceeds at least three times as rapidly as it does by any method now in general use. By this same technique, synthetic fibers may be dyed in a continuous process in no more than 10 to 20 seconds. A beater mechanism sharply vibrates the cloth before it leaves the actual bed, in order to remove all the glass beads *(99)*.

Fluid-bed dyeing is especially efficient in the case of disperse acetate, azoic, and fiber-reactive dyes. It does not seem to offer any great advantages over known methods of dyeing with vat, direct-cotton, acid, and premetalized dyes. The following techniques are examples of the use of glycerine in fluid-bed treatments.

Disperse Acetate Dyes. In the fluid-bed dyeing of Dacron, nylon, and acetate, disperse acetate dyes may be applied by means of the American "Thermosol" process. Drying and dye fixation are combined in a single step by passing a cold dispersion of dye through the fluid bed, which is kept at a temperature between 347 and 428°F (175 and 220°C). Generally, 0.2% wetting agent and five percent by volume of glycerine, diacetin, or triethanolamine are used. The amount of dyestuff needed is determined by the expression at the mangle and the desired depth of shade. When this method was tested, there was no evidence of ring dyeing, and the wash-, crock-, and lightfastness were at least as good as those conventionally obtained. However, azoic dyes sometimes gave better fastness properties on acetate and nylon.

Azoic Dyes. A variation of the above method was used for dyeing Dacron, nylon, and triacetate, since fabrics of this type do not lend themselves to an application of azoic dyes by the method ordinarily used for the dyeing of cellulosic fibers. A dispersion of the naphthol and base is padded onto the fabric, and the latter is passed through a fluid bed at 374°F (190°C) for 15 to 30 seconds. Glycerine may again be used as the dyeing assistant. Diazotization and coupling are then carried out in much less time than is normally required at low temperatures. The three fabrics dyed in this manner proved fast to rubbing and washing. The effect on nylon, however, was the least satisfactory, and another method—also with five percent glycerine—is therefore now being tried. A third method is sometimes applicable *(100)*.

Glycerine Derivatives in Dyeing. Alkyd resins and other glycerine-based products have long been used in various textile-dyeing applications. To cite an example, the incorporation of certain multiple resins, one of which is alkyd, into cellulosic fibers [Fr 834,968 (1938)] increases the affinity of such fibers for acid dyes *(13, 46)*. Glyceryl phthalate alkyds, again in combination with other resins, have been employed to animalize cellulosic fibers, to the extent that such textiles could be dyed with acid wool dyes. An increase in the amount of animalizing resin added to the spinning mass was found to achieve greater depth of shade *(101)*. Other improved methods for the use of glycerine-containing resins in the dyeing of cellusoic materials are shown in Can 411,395 (1943) *(13)*.

On animal fibers, such as wool, better dye fastness may be obtained [Brit 450,868 (1936); Fr 801,131 (1936)] by treatment with a condensation product of long-chain fatty acids and glycerine *(20)*. A method for coloring woolen fabrics with insoluble dyeing of indigo, lactam, or chrome dyes consists in the combined application to the material of such a dye and a glycerine-oleic acid condensate *(16)*.

A less obvious use of resinous glycerine derivatives in dyeing concerns the preparation of protective coatings that are resistant to dyeing and other fluid treatments for the impregnation and covering of yarn supports [US 2,313,726 and 2,313,727 (1943)]. These coatings can be made by reacting a synthetic resin, such as an ester gum-modified phenolic resin, with a modified glyceryl phthalate alkyd *(28, 75)*. The role of glycerine-based resins in pigment coloring is discussed later together with pigment printing, under "ALKYDS IN PRINTING."

Many additional patents [eg, US 2,294,246 (1942); Brit 545,117 (1942)] list glycerine derivatives useful in the dyeing and printing of textiles *(26a)*. US 2,116,553 (1938) describes the use of polyglycerols in the production of dyeing assistants for woolen fabrics *(46)*. Complex products containing glycerine may be used as dye inter-

mediates (Fr 843,518) or as dyeing assistants [US 2,155,135 (1939)], such as leveling and stripping agents for vat and sulfur dyes (*9, 46*). These latter products are based on glycerol 1,3-dichlorohydrin, a derivative also used in the preparation of materials for increasing the fastness of direct dyes [US 2,132,074 (1938)] (*46*). A similar chemical, a glycerol chlorohydrin, is an intermediate for producing surfactant-type materials having wetting, emulsifying, and leveling properties useful in the mercerization and dyeing of textiles [Brit 500,032 (1939)] (*46*).

Compounds substantive to artificial fibers, such as a quaternary base obtained by reacting a chlorohydrin of a polyglycerol with octodecyldimethylamine, are useful in the dyeing of natural or regenerated cellulosic fibers or fabrics, alone or together with other fibers, such as wool [Brit 488,099 (1938)]. Pretreatment with such a compound permits subsequent dyeing in a single bath by means of the metachrome process (*9, 16*). Glycerol monochlorohydrin and glycerol butyral have been used to prepare special compositions for the dyeing of cellulose combinations, such as acetate [US 2,259,515 (1941)] (*18*).

Glycerol monochlorohydrin was also used in experimental work intended to clarify the mechanism of dye retention in cellulose fibers (*102*). This study, which won honorable mention a few years ago, was carried out by Rothenstein *(103)*, who impregnated natural or regenerated cellulose fibers with glycerol monochlorohydrin and, subsequently, with concentrated sodium hydroxide, in the manner of patents by Lilienfeld (Brit 335,994) and Dreyfuss (Brit 277,721). The various glycerol ether derivatives of cellulose thus formed on the fiber were used in tests with an acid dye, Acid Orange 7 (*CI* 15510), and a direct dye, Direct Red 2 (*CI* 23500), in an effort to evaluate two possible reasons for dye substantivity. According to one theory, dye adsorption occurs as a result of hydrogen bonding between the dye molecule and the fiber. This was ruled out in the case of Acid Orange 7. The other theory assumes that dye retention results from the aggregation of dye molecules in the capillary spaces of the fiber structure. The second series of tests, carried out with Direct Red 2, did not permit ascertainment of a specific dyeing mechanism. However, Rothenstein suggests that more meaningful results may be obtained with a direct dye showing a lesser tendency to aggregate, such as Direct Yellow 12 (*CI* 24895), and with very highly substituted glycerol ether derivatives. He concludes that dyeing experiments on cellulose fibers substituted with glycerol ether groups are useful in determining the nature of substantivity of some dyes for the cellulose molecule (*102*).

Among the nonresinous derivatives of glycerine, its esters with organic acids deserve special mention because of their powerful solvent action on dyestuffs. The esters of acetic acid are the most important, as they find considerable use as solvents for basic, mordant, and indulin dyestuffs, as well as for tannin (*92*). The suggestion to use glyceryl tartrate as a solvent [Ger 83,060 (1894)] may be of historical interest. In the same vein, Diserens reports that an old English firm used to prepare a water-soluble glyceryl lactate, which is not volatilized by water vapor, and to recommend its use as a solvent for basic, acid, direct, and mordant dyestuffs, as well as for disperse acetate dyes. Other esters mentioned in this connection are glyceryl formate, marketed as "Diformin" by a German firm and described, by Diserens, as an excellent solvent for basic dyes, and the glyceride of levulinic acid (*92*).

PRINTING———According to an AATCC survey made about ten years ago, a particularly high proportion of glycerine used in textile processing goes into the printing of fabrics (*8, 26, 51*). This result can hardly have been a surprise to textile printers or to others familiar with the field, since glycerine has been employed in formulations for the printing of virtually every kind of textile material, with almost every type of dyestuff and by a variety of printing techniques. It is noteworthy that textbooks on textile printing contain a vast collection of printing-paste formulas prepared with glycerine. Knecht & Fothergill, to name an old standard work, is replete with such data (*104*); Jacobs' "Textile Printing," exemplifying newer sources of reference, may also be consulted profitably for this purpose (*105*).

In a fundamental study of the relationship of consistency to quality in vat printing pastes, carried out for the AATCC by Glarum and later continued by Gleysteen *(106-113)*, the former selected for these tests a glycerine-containing standard thickener representing an average of cotton-printing formulas used in several print works, as follows (*110*):

	%
starch	6.0
British gum (80% soluble corn)	6.0
soda ash	13.5
sodium formaldehydesulfoxylate	12.0
glycerine	6.0
water	56.5
Total	100.0

Because so many factors affect the thixotropy, rate of flow (*108*), behavior in the steamer, and general performance of printing pastes, the authors found it impossible in the course of this study to isolate at any stage the contributing action of each of various assistants, such as glycerine *(113)*. It is to be hoped that additional work along similar lines in the future will clarify and explain quantitatively the part played by this valuable ingredient.

Empirically, however, as has been pointed out, many of the functions and uses of glycerine in textile printing are very well known. In the preparation of printing pastes it may be added either directly to the paste or to the thickener *(8)*, as was shown above in the thickener formula employed by Glarum and Gleysteen. According to Franken *(114)*, thickeners require the presence of a hygroscopic agent to prevent bleeding. A good thickener, besides maintaining the proper consistency of a printing paste, must counteract the capillary forces of the unprinted parts of the cloth. Since fabrics are treated before printing to give them good wetting properties, these capillary forces can only be overcome by a thickener that absorbs water fast and that swells rapidly in the steamer. Glycerine always gives good results, provided its concentration is not so high as to cause supersaturation of the printed parts of the fabric, which would then give off moisture to the neighboring parts and cause bleeding. This would defeat the purpose of the formulation. On the other hand, the concentration of glycerine should be high enough for the rate of water reaction to exceed that which takes place in the unprinted portions of the fabric. A number of textile printers interviewed by Pickett agreed that glycerine is highly effective as a hygroscopic agent in the neutral or acid aging of print colors. Its use prevents bleeding even where the temperature is maintained at 220°F *(10)*.

The solvent action of glycerine is even more important in printing than in dyeing, because a much higher proportion of dyestuff is used, and water alone is usually inadequate as a solvent *(37)*. As a polyhydric compound with wetting and lubricating properties, glycerine aids in producing "smooth pastes that clear completely from the engraved printing rolls and show decreased marking off on steambox rolls" *(37)*. It prevents "tarnishing" by keeping the color film on the printing roller in liquid form *(39)*. The chief chemist of a New Jersey printing plant interviewed on the subject called glycerine "un-

equalled" in this application *(10)*.

In the machine or screen printing of Bemberg rayon, which is particularly sensitive to some constituents of thickening agents, eg, gum arabic and crystal gum, glycerine is particularly useful as an additive that inhibits the breaking or creasing of the delicate threads. Such damage tends to occur even at normal drying temperatures (158°F), especially when the material is folded before washing. Glycerine protects the threads by giving them an elastic coating *(115)*. It also prevents the drying out and caking of thickener and excess color before washing, and thus assists in their subsequent removal. One plant even applies glycerine to the fabric prior to the printing of Bemberg rayons *(10)*.

By surrounding and penetrating the fiber, glycerine also improves leveling and penetration of the pigment or dyestuff *(10)*. This action is particularly evident in the case of materials that do not absorb color readily, such as threads under high tension or fabrics containing high-twist thread. Glycerine's moisture-imparting properties facilitate the penetration of such fibers *(116)*. Lesser, who mentions the fine leveling action of glycerine in connection with blotch as well as block printing *(8, 12)*, also considers its softening effect of value in a printing paste.

Cotton, Rayon and Similar Fabrics. The importance of glycerine in textile printing is dramatically illustrated by its widespread use in the printing of cottons. This was true decades ago and is still true today. In 1944, for example, Leffingwell reported that glycerine helps obtain optimal results in printing with direct colors *(76)*. In 1946, the same author and Lesser extended this statement to cover acetate as well as direct dyes, when applied to viscose as well as cotton *(60)*. In 1955, Lesser wrote that fast, bright prints of direct dyes on cottons may be obtained by adding a copper-glycerine complex to the printing paste *(8)*. According to these authors, a leading dye chemist, Sansone, frequently employed glycerine in his printing formulations, primarily on cottons and rayons, but also on silk and woolen goods. Sansone added glycerine to screen and spray printing pastes for use with a variety of colors and, often, for obtaining very special effects *(32, 44)*.

A fairly recent article in a Soviet journal shows glycerine in a formulation for the printing of cotton with Diphenyl Black printing pastes *(117)*. Such a paste, which is thickened with starch, contains

	g/l
4-aminodiphenylamine HCl	60
ethylene glycol or glycerol	40
30% acetic acid	120
potassium chlorate	50
Leucotrope O	80

Leucotrope O (benzyldimethylphenylammonium choride), in this formula, is used to obtain full blacks with a minimum of tendering. It decomposes with liberation of acid during steaming.

An older report in the same journal describes a method for the use of sodium dichromate in a single-bath process for the printing and dyeing of cotton fabrics with mordant dyes. In this procedure, the dichromate, glycerine, and a thickener, such as starch or tragacanth gum, are incorporated into an aqueous solution of the dye. The textile is passed through this dyebath and hence to the steaming chamber *(118)*. A still earlier Soviet publication mentions that glycerine is used in a printing paste that contains a dyestuff made from buckwheat hulls *(60)*.

A typical example of the present day American use of glycerine in the printing of cotton, rayon, and other goods is taken from the bulletin of a large dyestuff manufacturer *(119)*. In the following formulas, which refer to the application of a brown vat dyestuff, the pastes are stirred throughout preparation, and are then added successively. The goods are printed, dried, aged for five minutes, rinsed again, oxidized, rinsed, and soaped.

Vat thickening parts		*Reduction thickening parts*
90	wheat starch	90
180	water	140
160	British gum and	160
120	water. The resultant paste is heated to 200° F for 45 minutes and cooled to 120° F. Further additions are made as follows:	500
150	potash	50
100	water	–
100	reducing agent ($NaHSO_2.CH_2O.2H_2O$)	30
100	glycerine	30
1000	total by weight	1000

Thornton and Liquorice (British), in experimental work carried out to determine the relative importance of various factors affecting vat printing, confined their tests to cotton, using typical formulations of vat printing pastes, which contained dyestuff, thickening, sodium formaldehyde-sulfoxylate, alkali, and glycerine *(120)*. Concluding that the sodium formaldehyde-sulfoxylate concentration in the printing paste is the dominant factor, the authors proceeded to question the relative effectiveness of practically all other ingredients as well. However, they did not question the value of glycerine.

An example of the usefulness of glycerine in vat printing is cited by Lesser *(8)*, in connection with the dulling of blue shades produced during steaming at high temperatures. Better results are obtainable by the use of less reducing agent and more hygroscopic agent, such as glycerine and urea, in the printing paste. In the printing of dark shades, according to Linkletter, an increase of glycerine in the paste may boost the color value and intensity of the final print by as much as 30% *(121)*.

Miscellaneous textile-printing processes using glycerine and applicable to the printing of cottons include a method for obtaining very good white discharges on Coprantine dyeings *(47)*. Many Coprantine colors, a series of direct dyestuffs aftertreated with copper, are suitable for this use. This one-bath process has numerous practical advantages and is employed for both white and vat-color discharges. A wide variety of formulas for discharge printing paste made with glycerine are to be found in the work of Diserens *(87)*. In printing with cutch colors, the use of a vanadium chloride solution containing glycerine reduced the steaming time from one hour without pressure to three to five minutes *(62)*.

Glycerine also improves resist printing methods, as is shown in the following potash-Rongalite stock paste used by Lotz *(122)*:

	grams
wheat starch	70
tragacanth thickening 60:1000	130
British-gum powder	70
glycerine	80
potash	120
Rongalite C (sodium sulfoxylate formaldehyde)	80
Textile Printing Oil H	20

In addition to the above ingredients, this formula contains 130 ml of water.

Many resist whites are made with a zinc oxide paste prepared from 300 lb zinc oxide and one and one-half gal glycerine, and 35 gal gum tragacanth (two oz/gal). These materials are ground together until smooth enough for printing and the resultant paste is mixed with sodium acetate and/or soda ash and/or sodium sulfite. Colored-resist recipes contain one gallon of the zinc white paste to six gallons of vat or azoic dyestuff *(123)*.

Geiringer, who originated a resist printing technique for achieving half-toned, mat effects, employed glycerine in formulating suitable resistants. For producing white effects on colored backgrounds, he added a discharge agent, such as sodium sulfoxylateformaldehyde or sodium hydrosulfite *(124)*.

Aside from the fact that viscose and cuprammonium rayon are more sensitive to damage by heat and the

action of alkali and other chemicals than is cotton, the same types of printing pastes are generally used for both. In addition, linen, hemp, and ramie are usually printed in the same manner. Some sources specifically mention the use of glycerine in the printing of rayon.

To illustrate, Baumann describes the use of glycerine as a hygroscopic agent in the vat printing of rayons *(53)*, giving typical vat-gum formulas that contain 3% by weight of glycerine. Viscose or Bemberg rayon sheers may be pretreated with glycerine to prevent the brittle gums from cracking and thereby causing splitting of the goods. According to the same author, a typical discharge printing paste as well as a white resist each contains four percent glycerine *(53)*. Colored and white resists made with glycerine may be used in screen printing with vat dyes, by means of a modified "flash" method *(35)*. A recent example of glycerine in vat-dye formulations may be found in a patent on printing with indigoid vat-dye compositions *(125)*.

In materials for treating pile fabrics and in formulations for the discharge printing of rayon velvets, glycerine is likewise of value. In the latter application, its use in the paste is to prevent excessive loss of moisture from those areas on the pile to which color has been applied *(9, 29)*.

Wool, Silk, and Mixed Fabrics. Glycerine is frequently a component of standard printing pastes for woolen fabrics as well as mixed goods containing wool. It may be employed with acid colors, vats, or chrome dyes, and is useful in a variety of applications *(27)*, such as a process for the spray printing of woolen upholstery fabrics *(8, 41)*. Furlonger suggests adding glycerine to the thickener with colors that give difficulty on steaming *(126)*. In the case of a few cotton-type dyestuffs which are applicable to wool and silk, glycerine also gives good results when used in the printing paste *(121)*. Diserens includes glycerine in two typical formulations for the printing, with or without mordant, of wool slubbing with fast acid dyestuffs *(87)*.

In a comprehensive article on the printing of wool cloth and of mixed fabrics made from wool and other staple fibers, by far the majority of the printing pastes shown contains glycerine *(127)*. For example, four percent glycerine is included in each of four preparations illustrating the printing of wool cloth with different types of dyestuffs. The same amount is used in formulations intended for the vigoureux printing of wool/rayon-staple mixtures with mixtures of acid and direct dyes, whereas a slightly smaller quantity is used with either chrome or direct dyes. Vigoureux, or melange, is a technique for the printing of slubbing or sliver in order to obtain a "mixture" effect. Preparations for this type of printing on wool contain up to and above five percent glycerine. According to Potter, the primary function of glycerine in these applications is to prevent the drying out of the printing paste prior to steaming.

For the printing of chlorinated-wool and natural-silk fabrics when steaming conditions are dry, a well-known manufacturer recommends increasing the amount of urea or adding five percent by weight of glycerine (five prints per 12 gallons) to printing pastes made with fiber-reactive dyestuffs *(128)*. This new class of water-soluble dyestuffs, however, is intended primarily for use on cellulosic fibers. Fixation on the fiber takes place by direct chemical linkage and, as a result, the goods possess extraordinary fastness properties, especially with regard to wetting, washing, rubbing, and light *(129, 130)*. The formulas used for chlorinated wool and for natural silk are the same as those employed for cellulosic fibers, except that satisfactory fixation on both may be achieved without adding alkali to the printing paste. On silk, however, a slightly better yield is obtained with sodium bicarbonate, especially in heavy shades. Fiber-reactive dyes offer many advantages, being applicable by simple, rapid, and economical methods.

On Synthetic-Fiber Fabrics. Glycerine is also used in the printing of acetate as well as the new synthetic fibers. Acetate dyestuffs are frequently incorporated into the printing paste by mixing with a suitable thickener and a little glycerine. A few of the dyestuffs employed for cotton and rayon may also be applied to acetate, but most of them lack sufficient substantivity to the acetate fiber. However, if they are suitable, the addition of glycerine promotes uniform wetting and thus helps overcome the water repellency of cellulose acetate *(121)*.

Nylon fabrics may be printed with formulations such as the typical paste shown below *(53)*:

	%
vat color	8
glycerine	5
British-gum paste	67
potash	10
Hydrosulfite AWC	10
Total	100

Prints are aged for five to ten minutes in the rapid ager, then oxidized with perborate and rinsed well at 180°F.

Some difficulty is encountered in the printing and wet processing of Orlon polyacrylonitrile and Dacron polyester fibers, because both are hydrophobic in nature. The following experimental formulation gave fairly good results in the laboratory *(131)*:

	%
vat blue	5
water	10
glycerine	10
formaldehyde sulfoxylate	5
47% potash	15
gum tragacanth	55
Total	100

E. Alkyds in Printing and Dyeing

The development of a wide range of brilliant, lightfast pigments in the thirties stimulated a search for effective methods of printing and "dyeing" fabrics with pigments *(132)*. The emergence of the new synthetic fibers, which have poor wetting properties, aroused further interest in practical means of pigment application, as did the opportunities which pigments afforded of applying color simultaneously with flame-resistant or mildew-resistant finishes *(133)*.

Lacquer printing was tried for several years but was found to have a stiffening effect on fabrics, giving them a harsh, coated feel. However, the advent of resin binders led eventually to a solution of the problem *(53)*. Alkyd resins prepared from glycerine and dibasic fatty acids proved particularly useful as pigment bonding agents. Often other types of resins, such as urea- or melamine-formaldehyde and related resins, are employed in combination with them *(26, 41)*. These resin blends are designed to produce good fastness to washing and to drycleaning, as well as other desirable properties *(47, 76)*. Examples of special processes based on dispersions of alkyd resins in water or solvent media *(17, 18, 60)* include a method for flock printing [US 2,311,850 (1943)] and one for intaglio printing [US 2,356,794 (1944)].

The usefulness of alkyd-resin binders and dispersions depends largely on the ability of alkyds to wet and to adhere to pigment and textile surfaces. The use of these binders was followed by the development of pigmented emulsions *(134)*, when it was realized that alkyds are also capable of being emulsified and of becoming infusible and insoluble upon exposure to heat and air *(47, 132)*. The emulsion application of pigments in synthetic-resin mixtures containing alkyds offers so many advantages that it has become extremely popular within the last twenty years.

For example, in both "dyeing" and

printing, pigmented emulsions produce the same shade on a variety of natural and synthetic fibers. This property permits the even coloring of fiber blends. Because the application of color results immediately in the final shade, corrections may be made without loss of time *(135)*. Improved washfastness results from the emulsifying action of the alkyd-resin component in that it obviates the need for a water-soluble emulsifier. A high degree of durability has been achieved with resin films consisting of an oil-modified glyceryl phthalate and urea- or melamine-formaldehyde condensates *(121, 132)*. The discontinuous nature of the resin-and-pigment film deposited on cloth permits coating of the fibers without clogging of the pores, preserving the mechanical flexibility and the good handle of the fabric. The solid resin and pigment particles dissolved or suspended in the emulsion may be present in either the water or the solvent phase *(121)*. A number of patents cover emulsion compositions in which the fixation of color is achieved by oxidation and polymerization at elevated temperatures. The resulting prints possess good light fastness and a fair degree of fastness to repeated washing and to rubbing *(50)*. In general, these fastness properties of pigment prints or colorings are adequate for many uses where washing is mild or infrequent and where rubbing fastness need not be excellent.

Pigmented resin emulsions were originally of the water-in-oil type, and this system is still the most widely employed for printing. However, since the late forties much progress has been made with oil-in-water emulsions, which are particularly suitable for solid colorings *(135)*. In 1943 Atwell took out two patents that illustrate yet another use of alkyd resins in coloring textiles *(28, 76)*. According to US 2,313,726, resins obtained by reacting a modified glyceryl phthalate resin and a phenolic resin modified with an ester gum serve as dye-resistant coatings on yarn supports. According to US 2,313,727, alkyds in combination with other synthetic resins provides protective coatings for the covering or impregnation of supports employed in the dyeing or otherwise fluid-treating of yarns in package form. On the other hand, the most recent technique of pigment coloring utilizes a water-soluble synthetic resin in an aqueous dispersion system. This method is sometimes employed for cotton, rayon, and glass-fiber fabrics. A similar procedure, which has found more acceptance in printing, is based on a solvent dispersion system *(135)*. Nevertheless, the use of synthetic-resin emulsions still outweighs by far in importance any other method of pigment application to fabrics.

WATER - IN - OIL EMULSIONS——This type of preparation is easy to apply, gives sharp marks, and reproduces with accuracy even the finest engravings. It is used in both machine and screen printing, and may be employed to incorporate various water-soluble dyestuffs as well as pigments. In addition these emulsions are economical and have the advantage that their viscosity is determined by the amount of water present: the more water is added, the thicker the printing paste becomes *(53, 135)*. In the typical water-in-oil formulation shown below, the ingredients are emulsified by an assistant of the Peregal O type (a substituted ethylene oxide condensation product) *(136)*:

	parts
Aqueous Phase	
methyl cellulose	10
water	390
Oil Phase	
glycerophthalic resin modified with castor oil	100
xylene	60
Pigment Blue 16 (*CI* 74100)	10

Water-in-oil alkyd emulsions are also used in white and color discharge printing *(53, 132)*. For solid coloring, they have found application on a variety of Army fabrics and civilian goods during World War II. At present, however, only very small yardages are being colored with pigments in water-in-oil emulsions *(135)*.

OIL - IN - WATER EMULSIONS——This type of formulation permits the easy cleaning of padders, printing rollers, screens, and other equipment for applying pigment prints and solid colorings. Furthermore, there is less risk of fire and less of a ventilation problem than with the water-in-oil type, because the cleaning can be done with water rather than flammable solvents *(132, 135)*. Although oil-in-water emulsions have become increasingly popular as pigment printing media in recent years, their principal use is still in pigment padding, where their ability to form thin-bodied pastes containing relatively little solvent and large quantities of water is of great advantage. The oil phase of such an emulsion usually contains a solvent-soluble resin binder, such as an alkyd. Alkyl cellulose, or melamine-formaldehyde condensate. An example of such a preparation is given in Swiss patent 224,615 (1942), according to which glycerine is reacted with oleic or abietic acid or with a fatty acid derived from linseed, soybean, or Chinawood oil. The resin thus obtained is condensed with butanol and hexamethylenetetramine *(136)*.

Glycerine in the form of alkyd resins may also be used to counteract the tendency of pigments to migrate from the aqueous to the oil phase. Migration is inhibited by the addition of a nonhardening, water-soluble alkyd to the aqueous phase and of a solvent-soluble, thermosetting alkyd to the oil phase *(136)*.

F. Miscellaneous Textile Uses

Glycerine and many of its derivatives, in addition to their usefulness in the preparation, finishing, and dyeing or printing of textiles, have proven of value in numerous other textile uses. These include the production of dyestuffs and of man-made fibers, in which glycerine and/or derivatives serve as intermediates or as processing assistants; the synthesis of a large number of surfactants and textile specialty compounds, directly or indirectly containing glycerine; the preparation of diverse products, such as adhesive tapes and textile marking inks; and miscellaneous applications, such as tests for the examination and quality control of fabrics. These applications illustrate the range and versatility of glycerine as a textile chemical.

DYESTUFFS——Glycerine is used as a component in the synthesis of benzanthrone, an important dyestuff intermediate *(137)*. Several anthraquinone dyes made with glycerine, some of them closely related to or containing benzanthrone, were first prepared late in the nineteenth century. The earliest was Alizarin Blue, a mordant dye discovered in 1877. An acridine dye made with glycerine, Acriflavine, dates from 1910 *(138)*. In addition to these, the new *Colour Index* lists a series of Alizarin-type mordant dyes and two vat dyes, CI Vat Blue 20 (known as Violanthrone) and Indanthrene Dark Blue BT (or Cyananthrene 0), as being prepared with glycerine. It also contains detailed information on the manufacture, use, and patent coverage of all of these dyestuffs *(138)*.

The following examples illustrate the use of glycerine derivatives other than benzanthrone as dyestuff intermediates. Gregory, for instance, lists nine anthraquinone derivatives not related to benzanthrone with each of which glycerine monochlorohydrin forms a dyestuff *(139)*. Acrolein, obtained when glycerine splits out two molecules of water, yields another series of anthraquinone dyestuffs *(16)*. Venkataraman cites an example of a lightfast, blue acid dye suitable for use on wool and nylon prepared by condensing 2,4-dibromo-1-amino-

anthraquinone with aniline, then substituting a thiol group for the bromine atom attached to the 2-position, and reacting the thiol group with glycerine-alpha-monochlorohydrin *(137)*. Organic dyes with good solubility even in hard water, for use on either natural or synthetic fibers, may be made with epichlorohydrin or glycerine *(16)*. Epichlorohydrin may also be employed to synthesize intermediates for cellulose acetate dyes *(137)*. Dyestuffs with improved solubility in water and alcohol may be produced by printing glycerol phosphoric acid with certain basic dye groups, such as di- or triaryl methane, azine, oxazine, or thiazine, and azo-azine, azo, or acridine dyes. The resulting dyes are the glycerol phosphoric acid salts of these basic dye constitutents *(51)*.

Glycerine itself serves as an intermediate in the manufacture of certain copper-containing tetrakisazo dyes and of some metalized dyes which contain nickel or chromium *(16, 46)*. Nitrate esters of nonphenolic organic compounds prepared with glycerine or some of its derivatives serve as nitrosation agents and intermediates for some dyes and esters *(32)*.

MAN-MADE FIBERS——Glycerine has long been known as an intermediate or assistant in the production or treatment of man-made fibers. Thus, it has played an important part in the early history of both cuprammonium and viscose rayon, as well as acetate, having been used in various baths both before and after coagulation either to assist in the formation of the filament or to give the latter good spinning properties *(13, 47)*. A somewhat different application (US 2,244,855) consists in using a polyhydric alcohol, such as glycerine, in the primary acetylation of cellulosic esters, eg, cellulose acetate. The acetylation solution further contains a strong catalyst, a sulfate, and, preferably, water. This treatment of the raw material is said to produce improved, better-stabilized cellulose esters than were previously obtainable *(32)*. More recent methods of manufacturing and treating cellulosic fibers have continued to utilize glycerine in various ways *(40)*.

In processes for making protein filaments and yarns, glycerine has been similarly used to assist in the coagulation and, finally, the insolubilization of protein, especially casein, solutions. In the coagulating bath, it is particularly applicable because of its minimal influence on the carefully adjusted pH levels *(35, 47)*. For milk-derived casein fibers, which may be made into artificial silk, wool, or cotton fabrics, glycerine has also been used in the final softening treatments following insolubilization *(46)*.

An older method of making wool substitutes relied on the conversion of cellulosic filaments into fibers having wool-like characteristics. Hot glycerine was used in the final stage of this process and also in later modifications of the method *(33)*. Following the use of casein protein, hydrolyzed soybean protein was used to make artificial wool. These "wool" fibers are given the requisite amount of flexibility by after treatment in a solution containing at least 20% of glycerine by volume *(26a, 28)*.

A recipe for artificial silk was part of an early attempt at making synthetic products "derived from vegetable proteins." This "silk" was prepared by coagulating solutions of zein in electrolytes or in liquids in which zein is insoluble, such as an alcohol (100%) or water. The resulting plastic masses were rendered insoluble by the incorporation of small quantities of waxes, resins, phenols, sugars, glycerine, and oils or related products, such as terpenes. Formaldehyde might be added as an aid in making the protein water-insoluble *(140)*.

Bast fibers *(43)*, willow bark transformed into fibers *(28)*, and even fibers obtainable from seaweed *(13)* provide examples of unusual textile materials that may be spun with the addition of glycerine or a similar softener to the final bath. Chitin from shrimp waste *(13)* can also be made into a textile by a process utilizing glycerine. In the manufacture of synthetic fur from cotton or other fibers, glycerine is incorporated into a special backing for support of the threads *(43)*. The quality of asbestos garments may be benefited in various ways by treatment with an alkyd resin or with glycerine itself *(141)*. Thus garments of pure asbestos fiber, as well as mixed fabrics containing asbestos and cotton, or asbestos, cotton, brass wire, and other materials may be treated with a glyceryl phthalate resin, particularly an oil-modified alkyd, dissolved or diluted with toluene, acetone, or another suitable solvent. A coating or impregnating solution of this sort may be brushed or sprayed on, or the fabric may be immersed in it. It is claimed that this treatment greatly increases the durability of asbestos garments and decreases their tendency to give off dust or fluff. Reportedly there is no loss in heat resistance and no substantial impairment of the flexibility of the fabric *(142)*. The roughness of asbestos fiber may be reduced by treatment with glycerine. Asbestos yarn lubricated with glycerine may be knitted, rather than woven, without breaking. This treatment is desirable in the case of gloves and other protective garments for which knitting is more suitable *(143, 144)*.

Processes for manufacturing and treating fibers and fabrics made of the newer synthetic materials present ample proof that glycerine is retaining its important place in the production and the finishing of textiles. For instance, in the manufacture of filaments and yarns from acrylonitrile polymer, British patent 583,939 (1947) recommends wet-spinning a solution of acrylonitrile fibers from a volatile organic solvent into a hot glycerine bath maintained at a temperature of at least 212°F. A secondary bath also consists of glycerine *(47)*. Other patents for producing acrylonitrile fibers [eg, US 2,404,723 (1946) and US 2,426,719 (1947)] also indicate the use of glycerine in baths for spinning and coagulation *(47)*.

According to a later US patent *(45)*, a composition suitable for making synthetic filaments, films, and fibers is prepared by dissolving acrylonitrile polymers in N, N-dimethylcarbamate esters of a polyhydric alcohol, such as glycerine. Esters of this type are glyceryl bis-, glyceryl tris-, and glyceryl tetrakisdimethylcarbamates. Fibers produced from such compositions by dry or wet spinning or by cold drawing are decribed as possessing "high orientation, tenacity, elastic recovery, and low shrinkage."

Another US patent *(146)* describes the use of glycerine in lowering the extrusion temperatures and pressures required for the shaping of polyacrylonitrile fibers. Whereas the admixture of plain water (30 to 85%) to the dry, powdered polymer will lower the extrusion cycle to 170°C and 18,000 lb/sq in or less *(147)*, the incorporation of water and a suitable (poly)hydroxyl compound, such as glycerine, will reduce the cycle to as low as 140 to 170°C and 400 to 10,000 lb/sq in, respectively *(146)*. A British patent (747,798) discloses an interesting technique for improving the receptivity of acrylonitrile-based fibers to disperse, vat, sulfur, acid, basic, and direct dyes. To this end, glycerol alpha-alkenyl ethers containing only one ether group per molecule are copolymerized with acrylonitrile, so that the resulting copolymer will preferably contain 90 to 98% of acrylonitrile *(148)*.

SURFACTANTS AND SPECIALTY CHEMICALS——Glycerine and its derivatives have gone into the preparation of a large number of surface-active agents possessing

such properties as emulsifying ability, wetting action, detergency, and the like, and of textile specialties, such as solvents, softeners, and reducing agents. A comprehensive listing of commercial textile finishing agents, compiled by Diserens, describes a large number of such surfactants. The author lists trade names and manufacturers and, as far as available, composition, properties, patent coverage, and advantages or disadvantages. A relevant sample of the surfactant types discussed in this list is shown below, as follows *(38)*:

a) Several domestic wetting agents which are monoglycerides of coconut fatty acids. These include Arctic Syntex M, a sodium monosulfate and monoalkanoate of glycerine *(149)*, Nopco 1471 and 1471M, Oleoglycerol Sulfate COS, Wettal, and others;
b) A group of products manufactured abroad (in France and Germany) representing esters of the unsaturated fatty acids obtained by sulfonating the monoglycerides of unsaturated fatty acids, especially the monoglyceride of ricinoleic acid;
c) A number of French and American wetting and softening agents based on a sulfonated monoglyceride of ricinoleic acid;
d) A type of fatty acid ester, eg, a glyceryl oleate, stearate, or ricinoleate. Speel reports that esters derived from glycerine or other polyhydric alcohols and and from the higher fatty acids, such as oleic, stearic, and lauric, give excellent emulsifiers, usually of the oil-soluble but water-dispersible type *(37)*;
e) A softener consisting of the polyglycerides of tallow fatty acids plus Emulphor EL.

In an earlier volume *(92)*, Diserens mentions glycerosulfuric acid as one of the mineral acids that may be used to esterify fatty alcohols of relatively high molecular weight. The resulting products are water-soluble and possess good detergency.

Other examples of glycerine-containing surfactants may be found in various patents, as follows:

Detergents, emulsifiers, penetrants, and wetting agents made with complex glycerine derivatives for use in the dyeing and wet processing of textiles [US 2,155,899 and Fr 837,370 (1939)].

Similar compounds of equal complexity [US 2,167,236 (1939)].

Wetting agents, emulsifiers, or dispersing agents from glycerine chlorohydrins [Brit 500,412 (1939)] *(16, 44)*. Detergents and wetting or dispersing agents [Brit 511,473 (1939)] containing, for instance, anhydrous glycerine condensed with anhydrous ricinoleic acid.

Wetting, foaming, washing, and emulsifying agents useful in textile processing and as ingredients of laundry compositions [eg, US 2,203,883 (1940)]. One such compound is prepared by reacting beta-methylglycerine monochlorohydrin with sodium sulfite and by condensing the resulting product with a long-chain fatty acid *(32)*.

Wetting agents, dispersing agents, and emulsifiers [US 2,228,986, 2,228,987, 2,228,989 (1941)], one such product being formed by heating at 150-180°C for about two hours a mixture of glycerine, cocoanut oil, and triethanolamine *(32)*.

Textile softeners, emulsifiers, or wetting agents [US 2,258,892 (1941)] which are ethers of polyglycerols *(18)*.

Conditioners and softeners [US 2,284,127 (1942)] which are esters of polyglycerols *(26a)*.

Wetting agents and penetrants (US 2,167,326).

Textile lubricants (Brit 547,667).

Products to treat special dressings (Ger 696,822; Swiss 204,820) *(9)*.

Special compositions for textile cleaning (Ger 702,229) based on rather complex glycerine derivatives *(18)*.

Compounds made with glycerine ethers for addition to concentrated mercerizing lyes (Fr 827,471) to improve the wetting action of the lyes *(46)*.

Textile specialties include such products as the glyceryl acetates, or acetins, which find large-scale application as solvents for basic indulin and mordant dyes used in printing *(38, 35)*. Their use also prevents early lacquer formation in the printing color. Diserens cites a patent dating back to 1889 (Ger 37,064), which is presumably the first to cover these compounds. The commercial products he describes are mixtures of mono- and diglycerides of acetic acid containing small quantities of triacetin, the triester *(38)*. Speel points out that the acetins may also be substituted for glycerine in some of its humectant applications *(135)*. Speel also mentions the acetoglycerides, members of a series obtained by the acetylation of mono- and diglycerides. This group of products has been studied by Feuge and coworkers *(150, 151)*. The acetoglycerides have wax-like characteristics and appear to be highly promising for various specialty uses *(135)*. The properties and uses of glycerides, generally, have been thoroughly reviewed by Goldsmith, who gives 1853 as the date of their first preparation *(135, 152)*. Apparently, the surface-modifying characteristics of glycerides derive from their partial esterification, which leaves some of the alcoholic hydroxyl groups unesterified. Further modification may be achieved by introducing "alkylene oxide, sulfuric, sulfonic, sulfoacetic, phosphoric acid, and other radicals" *(135)*.

Textile assistants with softening properties include blends of soap, such as sodium or potassium stearate, with a chemical, such as glyceryl monostearate. Soap blends of this type are widely used to improve the handle of bleached cotton and rayon fabrics, especially knit goods, without affecting the clarity of the bleach or diminishing the brilliance produced by optical brighteners *(135)*. In the dyeing of glass fibers by the Francolor process, a protein carrier is employed to fix the dyestuffs on the fibers. Casein is highly suitable for this purpose, but even casein produces an increasingly harshening effect on the fabric in proportion to the amount that adheres to the glass fiber. A better hand may be obtained by adding a hygroscopic softener, eg, glycerine, or by aftertreating the dyeings with such a softener *(136)*.

As a polyhydroxy alcohol, glycerine also serves as a clarifier for the emulsifiable oils that are used as lubricants in the preparation and finishing of textiles. This clarifying effect of glycerine depends on its solubilizing and dispersing action on the emulsifiable oils in water *(135)*. In the building of hydrosulfite compounds glycerine aldehyde, or glycerose, may be used as a substitute for glucose. The sulfoxylate of sodium glycerose is a special dyeing assistant of very strong reducing power *(87)*. Thiodiglycerine is another glycerine-based textile dyeing agent *(16)*.

DIVERSE APPLICATIONS——Some glycerine derivatives and glycerine itself may be used in resin coatings and binders, eg, certain derivatives in synthetic-rubber coating [US 2,294,441 (1942)] and small quantities of glycerine in rubber substitutes [Brit 555,858 (1943)] used for textile coating *(26a, 60)*. In one type of adhesive, which is suited to uniting plies of cloth, wood, and other materials, the bonding agent is prepared from blood albumin, glue, and hexamethylenetetramine and contains 23 to 35% glycerine, dry basis [US 2,307,198 (1943)] *(26a)*. Polyvinyl acetate resins, which are thermoplastic substances often employed to

coat or bond fabrics as well as paper, may be plasticized or modified with compatible materials, such as glyceryl phthalate (alkyd) and phenol-formaldehyde resins or chlorinated rubber *(135)*. A discussion of colophony and glycerol rosin esters and their use in the preparation of adhesives and adhesive tapes may be found in a fairly recent review article by Hadert *(153)*.

Some textile marking inks contain glycerine as a vehicle and plasticizer. One such ink is made with "invisible" dyestuffs which become clearly visible when exposed to ultraviolet radiation [Brit 511,888 (1939)] *(32)*. In a somewhat similar compound (US 2,333,329) glycerine, along with water and isopropyl alcohol, is one of the principal ingredients of the liquid medium. This mixed vehicle contains a polyvinyl alcohol resin and a colorless fluorescent dye *(9)*. Other inks, suitable for making fabrics made of cellulose esters or ethers, consist of a pigment suspended in a mixture of 85 to 95 parts of glycol monoacetate and 5 to 15 parts of glycerine [Brit 473,627 and US 2,165,522 (1939)], the viscosity depending upon the amount of glycerine used *(9, 44)*. A marking crayon for use on fabrics during manufacturer [US 2,398,559 (1946)] contains glycerine as one of the essential components *(132)*.

Glycerine is incorporated as a nontoxic solvent and lubricant into a variety of drycleaning compositions, where it aids in the wetting and suspending of insoluble types of soil. Suitable formulations are available for removing a collection of stains that range from grease, mustard, coffee, chocolate, beer, champagne, rust, and inks containing aniline dyes to lipstick *(154)*. Glycerine alone or merely diluted is also highly effective in the case of many of these stains, as well as of tea, and fruit *(155)*. A composition known as the "general formula" is made by mixing the ingredients shown below and adding three to five drops of a rust remover or dilute hydrofluoric acid. Small amounts of butyl alcohol are then added slowly until a clear solution is obtained, whereupon 0.5 part by volume of oleic acid is added. The oleic acid takes several hours to dissolve completely.

"General Formula"	*parts*
glycerine	4.00
acetic acid, glacial	0.75
methyl alcohol	1.00
lactic acid	1.00
amyl acetate (CP)	1.00

This drycleaning aid may be employed on cotton, rayon, silk, and acetate fabrics and is considered fairly safe on many dyed materials. However, before use on acetate, the solution should be tested on an acetate-satin sample. This preparation will remove tannin stains, provided they are not too well oxidized, such as "coffee, tea, beer, cola beverages, ginger ale, and other soft drinks." It is also useful in removing many fruit, ink, or dye stains *(155)*. Hot glycerine in soap-and-water spotting solutions is claimed to be an excellent detergent for certain types of spots, particularly on textiles dyed in delicate shades. Many preparations containing glycerine are used to treat rugs and carpets in order to "bring out the colors, improve the sheen and leave the pile soft, yet resilient" *(154)*. The following composition *(156)* is typical of such a compound:

	parts
coconut-oil soap	12.0
ammonia (28%)	2.8
glycerine	7.9
water	77.3
Total	100.0

Another formulation for floor coverings is a filler to keep a rug from curling while maintaining its flexibility, another is a composition to stiffen rugs, and yet a third is a nonslip preparation *(154)*. Methods for the wet cleaning of generally soiled upholstery have been described by Smither *(157)*.

An unusual process utilizes glycerine as an aid in the preparation of rags for fiber recovery. The rags are first freed of dirt by washing, then soaked in a solution containing three percent glycerine and/or an oil-in-water emulsion. In the manufacture of flock, the rags are then dried and ground. In yarn production, however, the dried rags may be stored for subsequent grinding or other processing. But prior to further treatments the dried and stored rugs must be passed through a water bath for reconditioning *(41)*.

TESTS — Glycerine is employed in a number of tests that may be carried out in the course of textile processing. Bohme, for example, describes an application concerning the use of glycerine in the microscopic study of fibers *(43, 158)*. According to Fletcher, glycerine is employed to mount mixed fibers for quantitative analysis under the microscope *(44, 159)*. Permanent mountings of textile filaments may be made with glycerine jelly, a product prepared from one oz gelatin, ¾ oz glycerine, and ¼ oz tincture of camphor. The gelatin is soaked in water, drained of excess, and melted in a water bath. The glycerine and camphor are then added to the molten gelatin. Before use the resulting glycerine jelly must be remelted at a temperature not exceeding 50°C *(44)*. A microscopic technique for identifying flax and hemp uses glycerine as well as a mixture consisting of equal quantities of glycerine, alcohol, and water. Linseed oil residues on desized viscose may be detected by means of a microscopic technique utilizing special staining solutions which contain glycerine. Lanital in mixed fabrics containing natural wool is determined with the aid of a glycerine-containing solution *(44)*.

An effective method for the microscopic examination of mold spots on undyed cotton goods and, by adaptation, for the study of molded yarns in general, has been described by Meissner as follows:

> The fabric is freed from sizing and other extraneous matter by boiling in water, and is then dyed with a selective dye that will adhere only to the parts attacked by mold. After one to two minutes' immersion in a warm lactophenol solution prepared with one part of glycerine and two parts each of phenol, lactic acid, and water, the cloth is soaked in a one percent aqueous solution of Cotton Blue. Any excess dye is removed by washing the fabric in water and immersing it once more in the lactophenol solution. The fabric is then ready to be examined *(43, 160)*.

In view of the extensive and steadily expanding application of fiber microscopy to textile research and quality control, the usefulness of glycerine in this field is not to be overlooked. In his recent book on the principles and methods of fiber microscopy Stoves also discusses the industrial uses of this technology in the examination of the newer synthetic fibers as well as the older cellulosic and animal fibers *(161)*.

A nonmicroscopic test utilizes glycerine as an important component of a standard soiling mixture. This preparation contains seven g lampblack, 150 g glucose syrup, 150 g glycerine, and one gallon of water. It represents "water-bound" soil and, in combination with formulations representing "oil-bound" soil, is used to evaluate the relative detergency and wetting power of surfactants employed in various textile operations (26a, 162).

Sometimes it is necessary to test for glycerine itself. A simple but effective procedure consists in heating a few drops of the product to be identified and adding approximately 500 mg of potassium bisulfate. If glycerine is present acrolein is formed and is given off as a pungent vapor. This is the technique described in *US Pharmacopeia XV (39, 163)*. An older reference from abroad indicates two methods of glycerine identification *(164)*. The presence of glycerine

on a fabric may be determined with relative ease by extracting the cloth with a solvent for fats and oils. The solution thus obtained is washed with water and evaporated. Glycerine leaves a nonvolatile, nondrying residue, which may be definitely identified by heating with powdered potassium bisulfate to obtain acrolein. This procedure may be very helpful in matching a competitive textile finish *(39)*.

The various assay methods for glycerine followed officially in the United States and Canada have been developed by the American Oil Chemists' Society *(163, 165)*. The preferred method of analysis for glycerine, applicable if no other polyhydric alcohol containing three or more hydroxyl groups is present, is nowadays the sodium periodate oxidation method, which largely replaces the acetin *(7)* and the dichromate method, being more accurate, specific, rapid, and easier to perform. The sodium periodate oxidation test (AOCS Official Method Ea 6-51; revised April, 1954) is based on the reaction taking place between glycerine and sodium periodate in an acid solution. The products formed are aldehyde and formic acid. The amount of formic acid obtained is a measure of the amount of glycerine in the sample *(163)*.

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Piedmont Section ——

PROCESSING OF ARNEL/COTTON BLENDS BY COTTON DYEHOUSE PROCEDURES*

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The minor changes which should be made when a cotton fabric containing Arnel is processed through the cotton dyehouse are discussed. In addition, a method for dyeing the Arnel portion of an Arnel/cotton fabric using a pad-steam range is covered. It is shown that, by combining this procedure with normal cotton-dyeing methods, a wide range of effects can be obtained, including cross dyeing, union dyeing and reserves. Costs are not discussed. Nevertheless, the procedures described are sufficiently straightforward to indicate their economic feasibility.

Development work on the contribution of various percentages of Arnel blends with cotton has resulted in the following types of advantages:

1) The use of low blend percentages of Arnel (approximately 20-25%) in conventional cotton fabrics can achieve unique color effects on cotton dyehouse continuous equipment.

2) The use of approximately 50% with cotton can produce fabrics such as shirtings, poplins, flannels and gabardines with ease-of-care properties, durable pleats and good crease retention, in addition to the versatile color styling.

3) The use of up to 70% Arnel for medium to heavy weight goods, where wear resistance and strength are not critical, permits the construction of fabrics with wash and wear properties for such uses as women's suitings, skirtings, sport shirts, bathrobes and Bermuda shorts.

INTRODUCTION

CONSUMPTION-WISE, cotton has been by far the most important textile fiber. This is due to many factors, not the least of which is price, but there are other reasons, among which are ease of processing, low cost of dyeing, and excellent wet strength. With cotton alone, there can be produced a large variety of fabrics with good general properties and in a wide range of shades and styles. Nevertheless, if cross dye effects are required, the cotton must be dyed either in stock or yarn form. In order to get cross dyeing after the fabric has been woven, it is necessary that another fiber be present which has different dyeing properties.

The addition of such a fiber must not detract from, and preferably should enhance, other properties such as dimensional stability, pleatability, improvement in hand or appearance, wrinkle resistance, ironability, and crease retention. Likewise, the added fiber must be available in sufficient quantity and at such a price as to make it saleable in a competitive market. The new fiber must also process efficiently and economically through the usual textile processes of picking, carding, drawing, spinning and weaving.

Perhaps the most important feature is the processing of such a blend through the standard equipment of the cotton dyehouse. The fabrics or the fibers contained therein must withstand such continuous processes as singeing, mercerization, bleaching, and vat and sulfur dyeing, under conditions of high tension, heat and alkali. Such fabrics must also be amenable to chemical and mechanical finishing treatments such as are normally given cotton fabrics.

A critical examination of the various synthetic fibers on the market today which might be used in blends with cotton reveals that Arnel triacetate seems to meet many of the requirements listed above *(1, 5)*. Arnel blends well with cotton; it has entirely different dyeing properties; it can be made available in quantity and at a price comparable to that of combed cotton. Arnel's hydrophobic properties contribute dimensional stability, wrinkle resistance and pleatability. Selected vat and sulfur dyes leave it practically unstained. It is sufficiently resistant to alkali so that it can be passed through a normal mercerization process followed by neutralization without deleterious effects. Likewise, modified bleaching procedures can be used which will give adequate whites on blended fabrics. Several millions of yards of a cotton warp/Arnel filling chambray have been dyed in synthetic dyehouses in the last year. This basic construction and many fancy variations of it have become very popular recently.

In this paper, we will outline the dyeing and finishing procedures which were developed to permit the efficient adaptation of a number of specific cotton/Arnel fabrics to available cotton dyehouse equipment.

PREPARATION

The *singeing and desizing* of an Arnel/cotton blend can be done with standard procedures and no melt balls have been noted on Arnel in singeing. Singeing as the first operation has no effect on subsequent dyeing of Arnel, unlike the experience with other synthetic fibers—eg, polyester or polyamide fibers—where slightly fused portions dye darker and give a mottled effect. This applies to a range of blends from 70/30 Arnel/cotton to 90/10 cotton/Arnel. Desizing is practiced using standard cotton desizing procedures if standard sizes are involved.

EFFECT OF ALKALI ON ARNEL ——One of the limitations of standard or secondary acetate *(6)* is its tendency to deluster and lose acetyl value by saponification if scoured at high temperatures or bleached at high temperatures using too high a pH while undergoing vat dyeing or mercerization.

* Presented by G C Ward before the Piedmont Section at the Washington Duke Hotel, Durham, NC, on April 26, 1958.

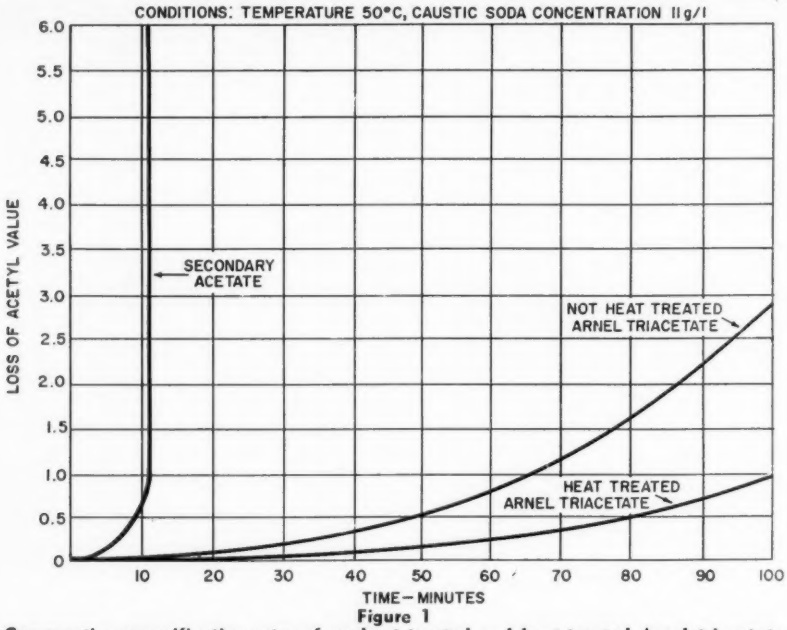

Figure 1
Comparative saponification rates of nonheat-treated and heat-treated Arnel triacetate vs secondary acetate

Arnel triacetate has much greater resistance to saponification under these same conditions. Figure 1 shows the comparative loss in percent combined acetic acid during vat dyeing of secondary acetate and heat-treated and nonheat-treated Arnel triacetate. Figure 2 shows the effect of dyeing for one-half hour and one hour on a check fabric in a typical vat dyebath using a vat dyestuff which stains Arnel quite heavily (Vat Blue 6, *CI* 69825/6). The middle squares, which are heatset, are much less stained than the unheatset Arnel. This shows that the heatset fabric is considerably more resistant to dyeing than the unheatset; also, that with a longer time of dyeing, the shade on the Arnel becomes considerably heavier. Figure 3 shows the same differences, but here we have used a dye (Veranthrene Brilliant Blue HCRK) which leaves the Arnel practically unstained.

The critical variables for preventing the saponification of Arnel triacetate are the immersion time and temperature, rather than the concen-

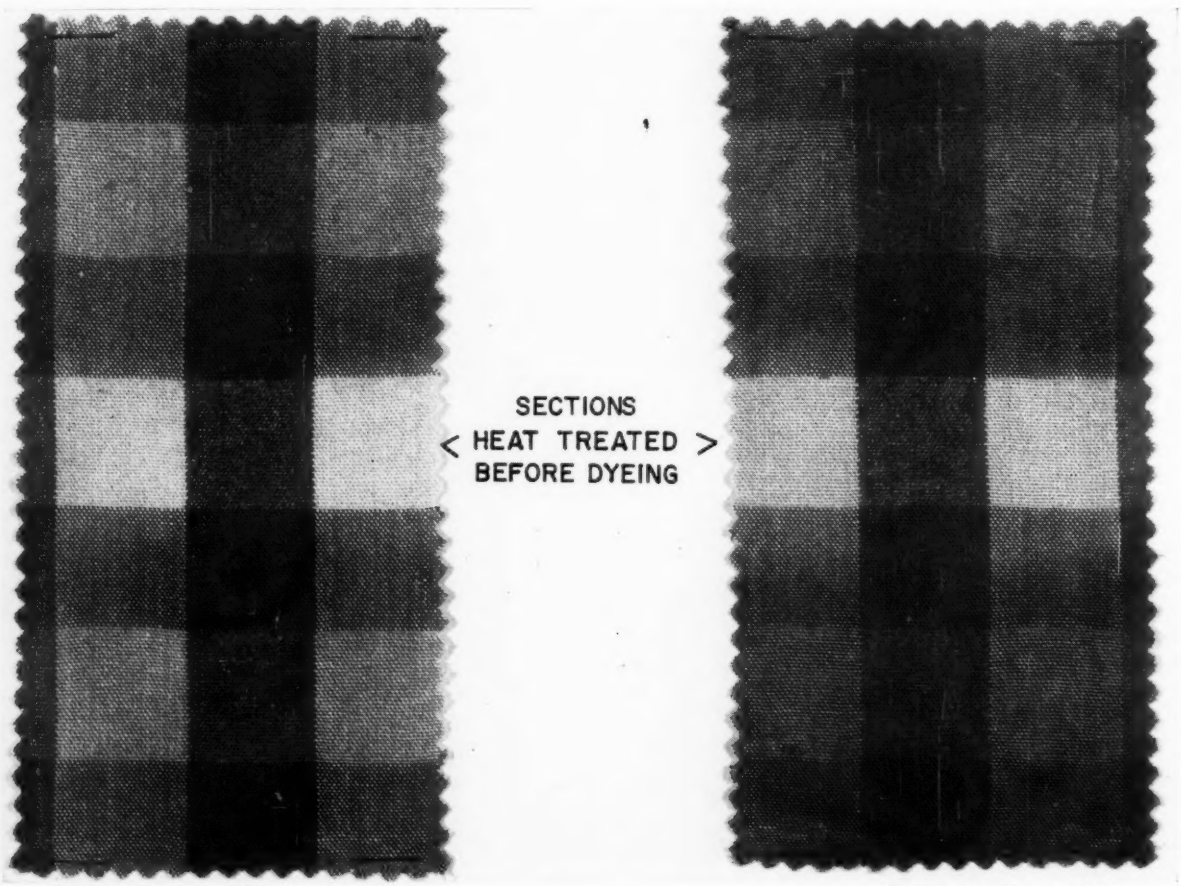

Figure 2
Hot-dyeing type vat dye not recommended for Arnel reserves
Vat dyeing method: pigment pad-jig (8 oz/gal Vat Blue 6 using 1.5 oz/gal caustic soda)

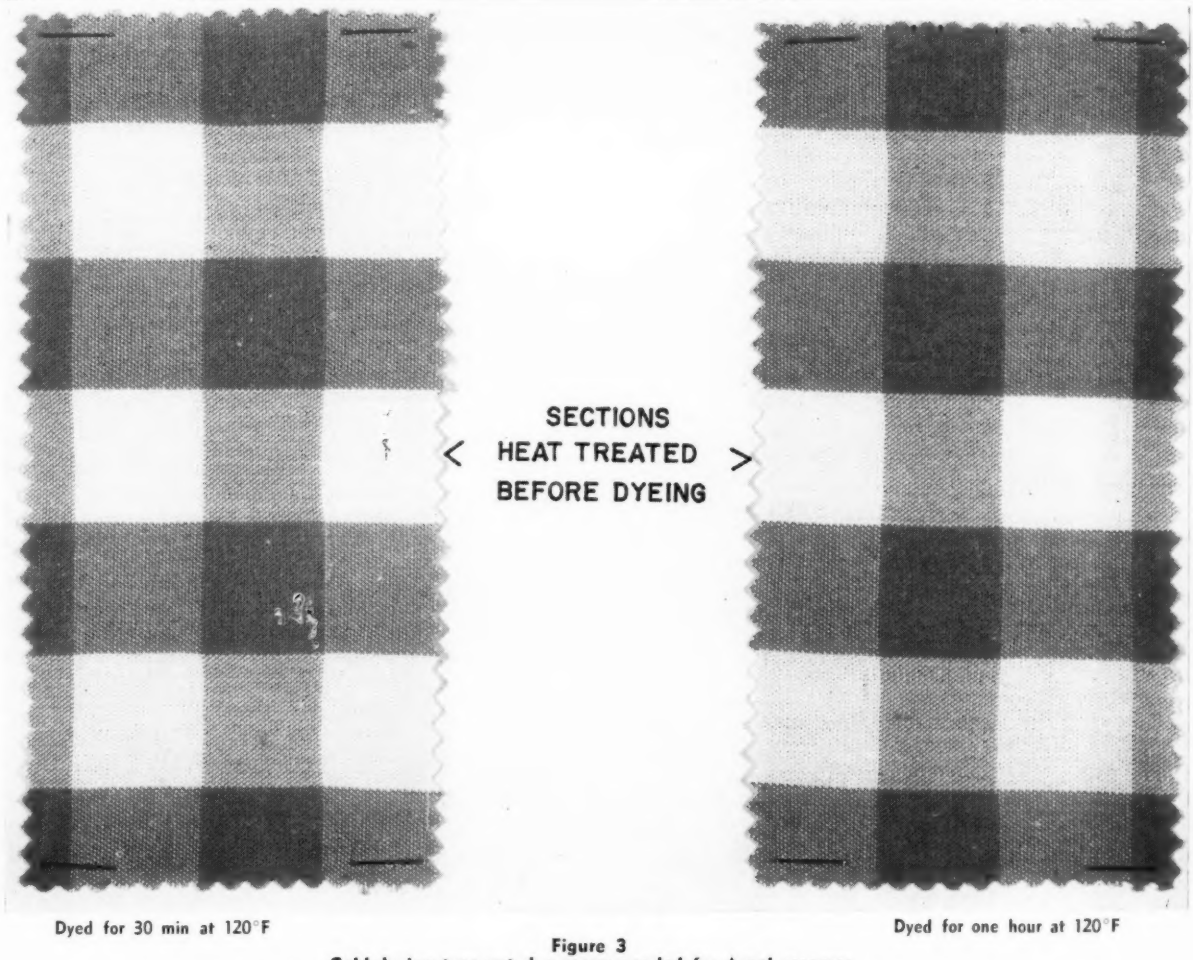

Figure 3
Cold-dyeing type vat dye recommended for Arnel reserves
Vat dyeing method: pigment pad-jig (6 oz/gal Veranthrene Brill Blue HCRK using 1.5 oz/gal caustic soda)

tration of the alkali. Therefore, continuous procedures, such as mercerizing and vat dyeing at high temperatures, have little effect on Arnel, provided the fabric is neutralized immediately at the exit of the units. Mercerization can be done using 30-55° Twaddle caustic soda, applying the conventional hot water spray if the frame type is used. Sodium bicarbonate buffering, CO_2 or SO_2 gas injection, or acetic acid neutralization subsequent to hot water washing, should be used in the last exit boxes for neutralization to below pH 9.0. The standard cotton kier-boiling process will completely saponify the Arnel and should be avoided.

BLEACHING —— A thorough bleaching is generally necessary on cotton fabrics to remove motes and prepare the fabric for good absorbency for subsequent dyeing. A certain alkalinity is necessary in peroxide bleaching for the best removal of motes in carded cotton yarns. As mentioned above, the critical factors in saponifying Arnel are immersion time and temperature. In continuous bleachings by the J-box system, the time (one hour) and the temperature (210°F) exceed the limit of Arnel's resistance to saponification if caustic soda and/or silicate are used. However, many styles of Arnel/cotton printcloth, flannels and towelings, containing lower grade carded cotton fiber, have been bleached successfully with excellent removal of motes and bleached white effect. These effects are achieved by continuous J-box rope bleaching employing a modified buffered continuous peroxide system using Borax and TSPP or DSP instead of caustic soda and silicate. These modified nonsilicate bleaches are commonly used for cotton containing metallic yarn.

An example of a typical preparation of a cotton/Arnel printcloth or broadcloth is shown in Table I.

Some constructions, such as poplins or chambrays, do not lend themselves

TABLE I
Example of a typical preparation of a cotton/Arnel printcloth or broadcloth

Singe, flame-type machine.
Desize, saturate with Rapidase (a standardized mixture containing amylolytic and proteolytic enzymes) and run through J box.
Continuously rope wash.

Bleach:
Conditions: Feed wet into saturator solution:
160 gallons (133 lbs disodium phosphate)
(33 lbs Borax ($Na_2B_4O_7.10H_2O$)
pH 9.0
0.9% solution peroxide (50%)
Peroxide pickup by weight: approximately 0.5%
One-minute immersion in saturator
Feed into J box. Temperature: 210° F. Time: one hour.
Continuously rope wash.
Can dry.
Frame mercerize: Speed 80 ypm
Caustic soda conc 52° Tw. 30 sec immersion in caustic soda
Hot-water spray
Two boxes hot water
Two boxes: 1st, 140° F, 50 lbs bicarbonate
2nd, 100° F, 50 lbs bicarbonate
pH of cloth leaving the unit = 8.5
Dry

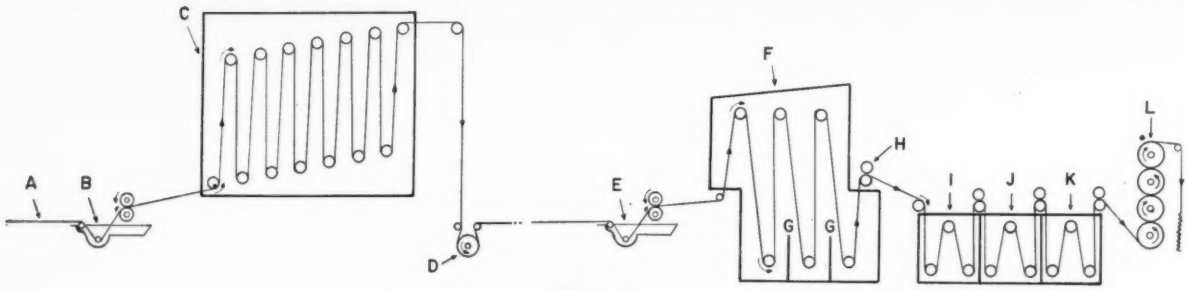

Figure 4
Schematic diagram of a typical pad-steam range

A—Entering cloth
B—Pigment padder
C—Hot-flue drier
D—Cooling can
E—Chemical padder
F—Steam chamber
G—Baffles
H—Exit nip
I, J, K—Rinsing, oxidizing & soaping range
L—Dry cans

to rope bleaching and have to be bleached on continuous open-width bleaching ranges employing the same buffered system described above.

If continuous open-width bleaching ranges are not available and a discontinuous jig bleach is necessary, a jig bleach can be employed with good results after mercerizing (Table II).

CONTINUOUS DYEING OF ARNEL TRIACETATE

A practical and economical pad-steam *(7, 8)* process has been developed for the continuous dyeing of Arnel in blends and combinations with cotton on available cotton dyehouse equipment (Figure 4).

The essential feature of this process is to first solubilize the selected disperse dyes in powder form in a high-boiling solvent, such as triethyl phosphate, which is heated prior to adding the dye by means of direct or indirect steam injection to 210° F. Boiling hot water is added to the solvent solution in a storage tank to the required volume. The hot water solution of the solubilized dye is then padded onto the fabric, which permits uniform distribution of the dye.

Subsequent steaming at 215-220°F for approximately 30 to 60 seconds results in complete penetration throughout the fiber cross-section and rapid migration of the dye from the cotton into the Arnel, thus utilizing all available dye and preclearing the cotton to some extent.

Immediately after the steaming, the fabric is led through two Williams Units or boxes of boiling water to wash out the solvent, and is subsequently soaped with chip soap at the boil.

The amount of solvent required depends on the concentration of dye. The quantity of dye again depends on

TABLE II
Example of a typical jig bleach after mercerizing

50-gallon jig (preferably covered)
3.5 qts hydrogen peroxide (35%)
Two lbs sodium metasilicate (granulated Metso)
Two ozs of a cryptoanionic, such as SandopanDTC
One lb TSPP
One and one-half hours at 185° F. pH 10.2

TABLE III
Typical continuous pad-steam dyeing of Arnel in a bleached and mercerized 55/45 spun Arnel/cotton poplin

CONDITIONS:
Shade: Charcoal
Pad volume: 100 gallons
Temperature of padding solution: 205° F ± 5° F
Pad heated with direct steam
Dipping time in pad: four seconds
Speed: 60 ypm
Steaming time: 50 seconds
Steaming temperature: 222° F
Two boxes boiling water
Two boxes chip soap + TSPP at 208° F
One box hot water
One box 120° F water
Can dry

Pad Formula: 100 gallons

% Dye Solution:		
0.55%	(4 lbs, 11.5 ozs)	Eastman Blue B-GLF
0.1 %	(13.5 ozs)	Eastone Red N-GLF
0.15%	(1.25 lbs)	Eastone Yellow 2R-GLF
15 %	(135 lbs)	triethyl phosphate

Dissolve the disperse dye powder in the hot (205-210°F) triethyl phosphate; add hot water near boiling temperature to the triethyl phosphate-dye solution at the required volume; pad at 205°F.

such factors as fabric construction, absorbency of the fabric, pad dipping time in the hot water-solvent media, and steaming time and temperature. For example, for a charcoal shade on Arnel in a 55/45 Arnel/cotton poplin, 15% TEP and aproximately 0.8% solution of dye was used with a long dipping time and one minute steaming at 222°F (Table III).

If more than two percent solution of dye is required for a certain shade, 20% triethyl phosphate is recommended for proper solubilization of the dye.

On light and medium shades, the colorfastness performance achieved by this process is equivalent to that on Arnel dyed in conventional synthetic dyehouse machinery. The washfastness achieved by this process for heavy shades is somewhat better, particularly in resistance to staining.

CONTINUOUS DYEING OF COTTON IN BLENDS WITH ARNEL

USING VAT DYES——Selected vat dyes of the cold dyeing class (optimum exhaustion in the reduced state from 80-120°F) leave Arnel reserved if dyed continuously under controlled conditions. However, if the Arnel/cotton fabric is union dyed or the cotton dyed a light shade and the Arnel a dark shade, a critical vat dye selection is not necessary since a slight stain on the Arnel will not interfere with the union appearance nor with the wash- or lightfastness. The evaluation of various degrees of vat dye stains on Arnel shows lightfastness above 40 Fade-Ometer hours.

Arnel is much less stained in reduced vat dyeing as compared with the pigment pad method. The vat pigment, which is only partly reduced by insufficient amounts of alkali and reducing agent or too short a reducing time, will adhere to the Arnel surface.

The cold-dyeing vats have the advantage that they are easily reduced, which allows the application of the pigment pad method. The best continuous method for the achievement of reserve effects employs a long reduction time to reduce off all the vat pigment from the Arnel, thus clearing it. Reduction in one or two Williams Units, followed by steaming or chemical padding, followed by steam-

TABLE IV

List of selected vat dyes which leave Arnel triacetate reserved

		CI Name		CI No.
Blues:	Veranthrene Brilliant Blue HCRK	—		—
	Veranthrene Brilliant Blue HCGK	—		—
	Calcosol Blue 2BDG	Vat Blue	5	73065/6
	Indanthrene Brilliant Blue RCLN	Vat Blue	6	69825/6
	Palanthrene Turquoise Blue 3GK	Vat Blue	33	67915
Violets:	Indanthrene Red Violet RRK	Vat Violet	14	67895
	Veranthrene Brilliant Violet 45R	—		—
Reds:	Indanthrene Scarlet RA	Vat Red	29	71140
	Indanthrene Red RK	Vat Red	35	68000
	Indanthrene Scarlet 3GA	Vat Red	17	—
	Veranthrene Brilliant Pink BL	—		—
	Veranthrene Scarlet GK	—		—
Yellows:	Indanthrene Golden Yellow RKA	Vat Orange	1	59105
	Indanthrene Golden Yellow GKA	Vat Yellow	4	59100
	Calcosol Yellow GL	Vat Yellow	2	67300/1
	Calcosol Yellow PG	—		Pr 600
	Ahcovat Yellow 4G-700	—		—
	Ponsol Yellow 5GLL	Vat Yellow	22	—
	Veranthrene Yellow 6GKW	—		—
Greens:	Ahcovat Green 7G	—		—
	Veranthrene Brilliant Green H3G	—		—
Browns:	Indanthrene Brown RAP	Vat Brown	3	69015
	Indanthrene Brown GGA	—		Pr 113
	Indanthrene Brown GAP	—		Pr 380
Olives:	Indanthrene Olive RAP	Vat Black	27	69005

TABLE V

Example of a continuous one-pass union dyeing of Arnel cotton chambray using cold-dyeing reactive dyes

Shade: Apricot Ice
Range speed: 60 ypm

1st Pad:	7.0 g/gal Procion Yellow RS	
	0.53 g/gal Procion Blue 3GS	
	3.42 g/gal Procion Red 2BS	
	2.0 ozs gal sodium bicarbonate	
	2.0 g/gal Keltex (sodium alginate) dry	
	Temperature 80° F	
Hot flue:	One minute 15 seconds at 300° F	
2nd Pad:	(Equipped with steam jacket)	
	120 gallon pad volume	0.92 g/gal Eastman Blue B-GLF
		0.79 g/gal Eastone Red N-GLF
		1.57 g/gal Eastone Yellow 2R-GLF
		18 gals (15% soln) triethyl phosphate
	Temperature 195° F	
Steamer:	One minute at 220° F	
Two Williams Units:	Boiling water	
Two boxes:	Soap and TSPP at the boil	
Two boxes:	Hot water	
One box:	Water at 120° F	
Can dry		

TABLE VI

Example of a cross-dyed Arnel/-cotton flannel using fiber-reactive dyes of the monochloro type

Shade: Brown on cotton/Blue on Arnel

1st Pad:	4.1 ozs/gal Cibacron Yellow R
	2.0 ozs/gal Cibacron Brilliant Red 3B
	0.46 ozs/gal Cibacron Blue 3G
	1.5 lbs/gal urea
	2.5 ozs/gal soda ash
	2.0 g/gal Keltex (sodium alginate) dry
	Temperature 140° F
Hot flue:	Two minutes at 320° F
2nd Pad:	Four ozs/gal Latyl Brilliant Blue BG
	20% solution triethyl phosphate
	Temperature 200° F
Steamer:	One minute at 218° F
Two Williams Units:	Boiling water
Two boxes:	Soap and TSPP at the boil
Two boxes:	Hot water
One box:	120° F water
Frame dry	

ing, and one or two Williams Units reduction booster are advantageous for achieving optimum reserve effects on Arnel in continuous vat dyeing of the cotton portion of the blend.

The temperature of the reduced bath in continuous vat dyeing can be raised to 190°F for good penetration without saponifying the Arnel, provided the fabric leaves the unit buffered with a pH under 9. This can be achieved by adding bicarbonate in the last rinsing bath of the vat dye range or an oxidation with chrome and acetic acid.

Table IV shows a list of vat dyes which do not stain Arnel under above-outlined conditions. If both fibers are to be dyed in an Arnel/cotton fabric, the cotton should be vat dyed after the Arnel has been dyed. The caustic and hydrosulfite reducing bath will act as a perfect clearing bath of any residual disperse dye stain on the cotton and will also remove surface dye from Arnel, thus increasing somewhat the washfastness.

COTTON DYED USING FIBER-REACTIVE-TYPE DYES BY THE PAD-THERMOFIX METHOD—— The cotton may also be dyed with fiber-reactive-type dyes *(3, 4, 10, 11)* by the pad-Thermofix method.

The pad-dry-chemical pad-steam method of applying the reactive-type dyes on 100% cotton cannot be used in blends with Arnel if good Arnel reserves are desired.

The pad-Thermofix method allows a continuous one-pass cross or union dyeing of Arnel/cotton blends on standard cotton dyehouse equipment by the following method: Pad reactive-type dyes for cotton; dry and Thermofix in a hot flue; pad disperse dyes for Arnel; steam; wash.

Dyeings of high washfastness combined with economical advantages over vats can be obtained by the use of the reactive-type dyes. However, these dyes have a rather limited chlorine fastness and the lightfastness on cotton is only of acceptable level if monomeric urea-formaldehyde resins are used and if amine hydrochloride catalysts are replaced by zinc nitrate or magnesium chloride catalysts.

This above fact eliminates the reactive-type dyes for Arnel/cotton "wash and wear" end uses, for which dimethylol ethyleneurea-type resins are essential, which decrease the light fastness of the reactive-type dyes excessively.

However, there are many end uses on Arnel/cotton fabrics where the excellent reserves on Arnel, which are possible with the reactive-type dyes, can be used with advantage. One example is Arnel/cotton gingham or fabrics with large geometrical designs where a good reserve with vats would only be possible with a critical selection of cold-dyeing vat dyes.

Some fiber-reactive dyes (monochloro compounds) are padded at 140°F with the addition of 200 g/l urea and 15 g/l soda ash and have to be Thermofixed at temperatures above 300°F for best and level fixation.

The cold-dyeing types (dichloro compounds) are padded at 80°F with bicarbonate and sodium alginate thickener, and a temperature of 240-260°F will provide sufficient fixation.

Deeper shades are achieved with the monochloro-type reactive dyes compared to the cold-dyeing types.

An example of a continuous one-pass union dyeing of Arnel/cotton chambray using cold-dyeing fiber-reactive dyes is given in Table V. An example of a cross-dyed Arnel/cotton flannel using fiber-reactive dyes of the monochloro type is given in Table VI.

CONTINUOUS DYEING OF COTTON IN ARNEL/COTTON BLENDS USING SOLUBLE SULFUR DYES ——The following selected soluble sulfur dyes leave Arnel reasonably reserved and can be used for cross- or union dyeing:

Sulfur Black 1 (*CI* 53185)
Sulfur Blue 7 (*CI* 53440)
Sulfur Brown 14 (*CI* 53246)

An example of a continuous soluble sulfur black on cotton in an 80/20 cotton/Arnel printcloth is given in Table VII.

The dyestuffs shown in Table VIII are recommended for the pad-steam process since they have satisfactory solubility in triethyl phosphate and fastness properties on Arnel.

FINISHING OF ARNEL/COTTON BLENDS

For a white fabric containing 10-20% Arnel, at least seven percent ethyleneurea-formaldehyde resin should be used in the pad bath. If the fabric contains 40-70% Arnel, four to seven percent of resin may be sufficient to give adequate wrinkle performance. With colored fabrics, slightly lower amounts of resin (one to two percent less) may be sufficient.

It must be noted, however, that resin finishing which fixes the fabric in a flat state to a large extent destroys the ability of the fabric to be permanently pleated or creased. Blends of 50/50 or 70/30 Arnel/-cotton flannels can be permanently pleated without the need of resin in finishes as used on 100% cotton fabrics and are machine washable at 120°F. The losses in strength of cotton/Arnel blended fabrics on resin finishing to obtain "ease of care" performance can be expected to be about the same as observed on 100% cotton. The amount of resin necessary will vary depending on the Arnel content and whether the fabric is colored. "Heather" effects obtainable by reserve or cross dyeing make an important contribution to improved visual appearance after washing.

Losses in tear strength and abrasion resistance can be minimized by the use of softeners and thermoplastic latices in the formulation. These components can be selected only on the basis of preliminary trials and will vary according to blend composition, fabric structure, and hand requirements. These modifiers seem to have no visible effect on appearance after washing.

HEAT TREATMENT —— Fabrics containing high percentages of Arnel or combination fabrics (Arnel filling) should be heat treated for better stability, especially if they are continuously pad-steam dyed. The pad-steam dyeing causes some softening of the Arnel due to the triethyl phosphate in the steaming which, in return, causes some shrinkage of certain loose constructions or combination fabrics containing an all-Arnel filling.

This shrinkage has to be framed out after dyeing and subsequently set by heat treatment. A setting at 380-415°F is sufficient for that purpose. A slight strength loss, which is experienced by heat treatment of Arnel over 400°F, is not apparent on pad-steam dyed Arnel.

The heat-treatment step is recommended before resin finishing. Heat-treated Arnel accepts resins less readily than nonheat-treated Arnel, thus leaving the Arnel essentially free of resin, especially if the fabric is washed after curing. Heat-treated Arnel in cotton blends takes up only one-tenth of the amount of resin absorbed by mercerized cotton, as determined by nitrogen analysis of the two fibers in check-type fabrics.

TABLE VII
Example of a continuous soluble sulfur black on cotton in an 80/20 cotton/Arnel printcloth

Pad: 60 gallon pad mix:	150 lbs Sulfur Black 1 21 lbs So-Dye-Fide B (Na_2S and Na_2Sx in solution)
Temperature 190° F	
Two Williams Units:	
Each unit: 50 lbs Sulfur Black 1	
50 lbs salt	
5 lbs So-Dye-Fide B	
Temperature 190° F	
One wash box at 140° F	
One Williams Unit at 140° F:	6 lbs chrome 3 qts acetic acid
One box cold water	
Soap on soaping range	

TABLE VIII

Latyl Brilliant Blue BG
(should be dispersed in water phase)
Eastman Blue B-GLF
Lenra Blue RLS
Celliton Blue LAFR
Interchem Acetite Blue NSP
Eastman Violet 3R-GLF
Resoline Blue RRL
(should be dispersed in water phase)
Eastman Yellow W-GLF
Interchem Acetate Yellow HDLF-40
Eastone Red N-GLF
Eastone Red 2B-GLF
Nacelan Orange ARG
Eastman Yellow 2R-GLF

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QUESTIONS AND ANSWERS

Q: How does this process work on Dacron/cotton blends?

A: While the procedures we have discussed today were developed primarily for cotton and Arnel blends, we have nevertheless investigated certain other fibers. Using our recommended Arnel procedure, Dacron is stained. There are at least two reasons for the poor results on Dacron: first, we have selected disperse dyes which favor Arnel. If we were working with Dacron, we would use disperse dyes which favor Dacron. And secondly, but most important, the medium which we have used—namely, triethyl phosphate—does not give increased affinity on this fiber. If the process was to be developed on Dacron/cotton blends, we would have to find a different medium. In our early investigation, we tried quite a number of compounds; those which showed better affinity on Dacron were metacresol and methyl salicylate. However, these did not give anywhere near the color value on Dacron that TEP gives on Arnel.

Q: How does this process work on blends of Arnel/rayon or acetate/-rayon?

A: In the group of samples which I have here, there are quite a number of fabrics composed of Arnel and rayon which have been dyed at the same time as cotton and Arnel blends. We consider the process very promising for such a blend. If a fabric contains acetate, it is necessary to drop the concentration of TEP to somewhere between five to 10%. If higher concentrations are used, the acetate is seriously stiffened. For acetate, we would also consider the use of methyl

salicylate in place of TEP. Our work on acetate/rayon blends has been laboratorywise only; nevertheless, we feel that a commercial process could be developed for such a blend.

Q: How do the costs of this process compare with conventional dyeing on jigs or winches?

A: Let us first make a few assumptions: that we are going to use a pad bath containing 15-20% TEP which costs 42c a lb, that we get a 60% pickup of the color, and that we are going to dye a four-oz fabric. This indicates that the TEP cost will run .6-.8c per yd. The dyes used will average about $2.50 per lb. Dyestuff affinity is sufficiently good so that the dyestuff costs of even shades as heavy as black, navy, maroon and dark green plus the TEP will not be above four cents per yd on a four-oz fabric. Added to this, we must add the cost of the dyebath which is dropped at the end of the run. This can be anywhere from negligible to excessive, depending upon such factors as the length of the run and the volume of the pad bath. The dye and chemical costs for heavy shades at least, will be less than half what would be required on jigs or winches. For a complete cost picture, I believe your plant accountant will be in a better position than I to determine labor and overhead costs.

Q: Do you not have a considerable loss of color because of pickup of the cotton and this being washed off in the wash box?

A: Surprisingly, this is not the case. On an intimately blended fabric, the cotton acts as a reservoir for the Arnel dye. As the fabric comes out of the pad bath, it appears to be a solid shade, but as it comes out of the steamer, the cotton portion is fairly white. This means that the dyestuff and TEP transfer from the cotton to the Arnel during steaming. There is a surprisingly little amount of dye lost in the wash boxes.

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Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28 30, 1961 (Buffalo, NY); 1962 (Southern Region)

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Oct 17, Dec 5

HUDSON-MOHAWK SECTION

Oct 3 (Jack's Restaurant, Albany, NY); Nov 14 (Chelsea House, Tribes Hill, NY); Jan 16 (Jack's Restaurant, Albany, NY); Mar 27 (Chelsea House, Tribes Hill, NY); May 15 (Ladies night, Albany area); June 26 (Annual outing — Antlers Country Club, Tribes Hill, NY)

METROPOLITAN SECTION

Oct 10 (Kohler's Swiss Chalet, Rochelle Park, NJ)

NIAGARA FRONTIER SECTION

Sept 26 (Niagara Falls, Ont); Dec 5 (Buffalo, NY); Feb 20 (Niagara Falls, Ont); April 4 (Hamilton, Ont—joint meeting with CATCC)

NORTHERN NEW ENGLAND SECTION

Oct 17 (QM Research & Development Ctr, Natick, Mass); Dec 5 (Hotel Vendome, Boston, Mass); Jan 16 (Colonial Club, Lynnfield, Mass)

RHODE ISLAND SECTION

Sept 26 (Management Night — Warwick Country Club); Oct 23 (Providence Engineering Society); Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence)

SOUTHEASTERN SECTION

Dec 6 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION

Sept 26 (Hartford, Conn); Oct 24 Annual Meeting—Rapp's Restaurant, Shelton, Conn; Dec 5 (Rapp's Restaurant, Shelton, Conn)

LADIES PROGRAM FOR CHICAGO CONVENTION

THE Ladies Program Committee, under the chairmanship of Archie G Alexander, Arkansas Co, Inc, has prepared an excellent program of activities to insure fine entertainment for the ladies during their stay at the 37th National Convention in Chicago.

All lady guests are requested to register for the Convention at the regular registration desk.

Private Dining Room No 2 on the third floor of the Conrad Hilton Hotel is reserved as the ladies' headquarters for the Convention.

Tickets for all events are prepared in booklet form and no tickets may be obtained for separate individual events. The only exception will be the tickets for attendance at the Cinerama Show on Saturday. These must be purchased separately and will probably be available at the ladies' headquarters.

Following is the completed outline for the Ladies Program:

THURSDAY, OCTOBER 30TH

4:30 PM Reception and Cocktail Party. Private Dining Room 2, 3rd Floor, Conrad Hilton Hotel.

FRIDAY, OCTOBER 31ST

9:00 AM Visit to the Breakfast Club, nationally known radio program. Hotel Sherman, Porterhouse Room.

1:00 PM Luncheon and Style Show at Citro's, 181 East Lake Shore Drive.

7:00 PM Annual Banquet, Grand Ballroom, Conrad Hilton Hotel.

SATURDAY, NOVEMBER 1ST

11:30 AM Tour of the offices of the Morton Salt Company and Luncheon. "House of Color." 110 North Wacker Drive.

2:00 PM Cinerama Show. "Search for Paradise." Palace Theatre, Randolph and LaSalle.

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

58-16

Education: BS, Philadelphia Textile Institute; MS, Clemson College.

Experience: plant chemist.

Location desired: East or South.

Position desired: chemist or research chemist.

Age: 27; single; references.

9-22, 10-6

58-17

Education: Textile eng (chemistry), Tilburg; business school and school of languages.

Experience: sales, lab assistant, dyer and finisher.

Location desired: South, Southeast, New York, New Jersey or California.

Position desired: sales, sales development of intermediaries, fibers, textile chemicals or dyestuffs.

Age: 39; married (three dependents); references.

9-22, 10-6

58-18

Education: MS, textile chemistry, Lowell Technological Institute (member of LTI Honor Society); Medical Field Service School, Texas.

Experience: Assistant chemist, Finishing Dept; chemist—fiber development.

Location desired: New England, Northeast or Midwest.

Position desired: Technical service with finish manufacturer or detergent manufacturer.

Age: 27; married, two dependents; references. 9-22, 10-6

Elected to Membership

AUGUST 28, 1958

SENIOR

R W Eltonhead — P W Stewart
L R Schlitz — G F Wagner Jr

ASSOCIATE

Maurice A Lynch Jr

STUDENT

E L Eubanks — D B Stallworth

AATCC SUBJECT AND SPEAKERS BUREAU

The Subject and Speakers Bureau Committee of AATCC is now soliciting additional papers to augment its current file of available subjects and speakers.

Quarterly, a listing of these subjects is circulated to all local sections of AATCC, with an invitation to local section program chairmen to contact the speakers for section meetings. This file now consists of more than 50 subjects, and many sections have benefited from this service.

Those who have papers ready or in the process of preparation are invited to submit an abstract of the paper to the chairman or other members of the Committee.

Papers of a general nature, as well as technical papers, will be acceptable.

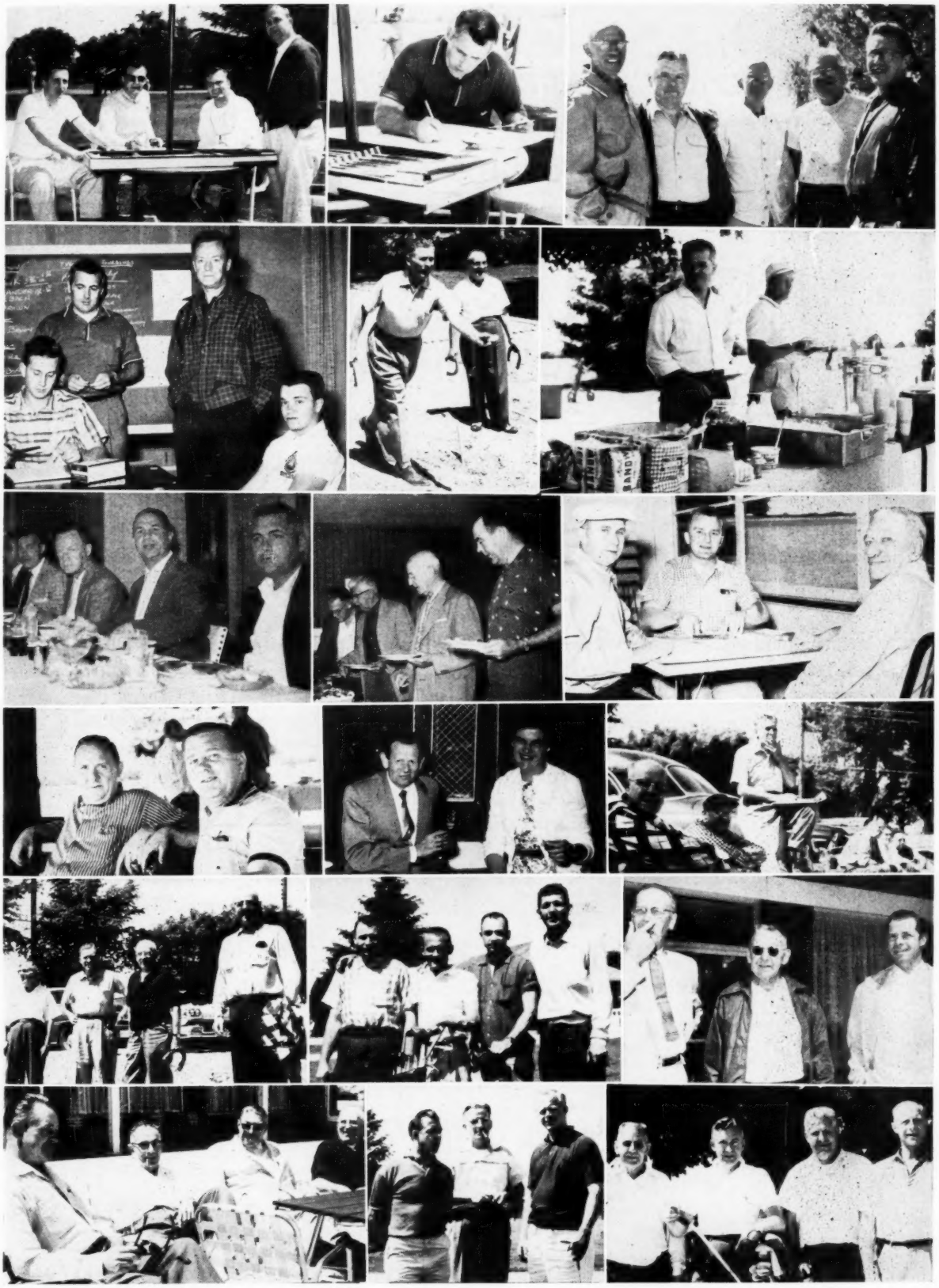
SUBJECT AND SPEAKERS BUREAU COMMITTEE

Mathew J Babey, *chairman*
P O Box 205
Bound Brook, NJ

Charles A Whitehead
American Dyestuff Reporter
44 East 23rd St
New York 10, NY

Mid-West Section Outing

June 13-14, 1958 • Brown's Lake Resort, Burlington, Wis



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Your prepaid subscription received promptly will insure your possession of this LIMITED EDITION, a tremendously valuable work on the free world's dyestuffs and pigments in commercial use. Published by the Society of Dyers and the Colourists (British) and the American Association of Textile Chemists and Colorists, these four volumes totaling 4586 pages provide the only complete reference of coloring matters available to those interested in this field. They include 3000 pages of application and fastness properties of coloring matters furnished by world manufacturers, chemical and structural information, characteristic reaction, index of products and trade names, fastness tests and rating methods, new and old COLOUR INDEX NUMBERS, Schultz and AATCC prototype numbers and a hue indication chart.

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ORDER NOW FROM:

American Association of Textile Chemists and Colorists

PO Box 28, Lowell, Massachusetts

SEPTEMBER SONATA
1958

Inter Alia—Inter Nos

P J WOOD

SALMAGUNDI

Acetate, Acrilan, Celon, Courpleta, Courtelle, cuprammonium, Dralon, Dynel, Fibrolane, Grilon, nylon, Orlon, Perlon, silk, Terylene, Thermovyl, Tricel, tussah silk, viscose, wool. 20 fibers, count them!

According to our esteemed contemporary, "Man-Made Textiles', all thees are combined into one yarn by the old established spinners Ormerod Brothers Limited, of Brighouse, Yorkshire.

Seventeen regenerated and synthetic fibers and three natural fibers, not one of which is cotton. And why not cotton?, we ask.

What do all these fibers have that cotton doesn't have?

M-M T goes on to explain that there is five percent of each fiber in the multifiber yarn; also that it is easy to spin and costs about the same as 100 percent Terylene (Dacron) or nylon.

We imagine it would take about as many pages of equations as this yarn has fibers to work out all the engineering information that would be required to use this startling new departure in textile yarns. It would take a dyer a lifetime to work out a 20-color combination on a fabric made of this material, and probably another lifetime to work out a solid shade having all the fastness properties required.

PS. If, by any chance, this paragraph should catch the eye of any or all of the Ormerod Brothers, we would be obliged if they would send a skein of this yarn, be it never so small, or a few square inches of a fabric made from it, which we will show far and wide on our travels, in the same way we did with a pencil cop of 400's cotton made in Bollington by Olivers'. We would also be obliged if they will also tell us if the natives of Brighouse still call it Briggus.

VISITING AROUND

If there is one thing we appreciate, next to the scientific and technical information we are able to glean from the foreign magazines, it is the opportunity the personal pages give us of visiting with good friends of other days.

Triply blest we were, the other day when, on one page of Man-Made Fabrics, we found the pleasant faces of three old friends and the name of a fourth.

John Boulton was one of these. He is the new president of the Society of Dyers & Colourists, into which Association he has put a lifetime of effective effort. As most of you know, he is the manager of the Courtaulds Ltd research laboratories in Droylsden, being associated for many years with our old classmate C M Whittaker, who preceded him in that position. We hear from Dr Whittaker from time to time; as a matter of fact, we owe him a letter at this moment. The next in order going down the page is Harry A Thomas, who was on vacation when we last called on him in his Manchester office a couple of years ago. Dr Thomas is head of the Use and Development Department of Courtaulds Ltd.

The last picture is a group of vips from Brotherton & Company, the British manufacturers of hydrosulfites and sulfoxylates and many other useful chemicals and dyestuffs, in which our old friend and correspondent Fred Heath is being made the subject of a presentation on the occasion of his retirement from the company after a service of 43 years. And Fred still looks like a boy!

The last item on that same page informed us that Sir Ernest Goodale, who has been president of the Textile Institute for the last two years, has been reelected president of the Silk & Rayon Users Association for the ?th time.

We are looking forward to seeing all these gentlemen, the next time they come over to this country, which, we trust, will be right soon.

FIRST, LAST AND ALL THE TIME

In 1956, certificates were awarded to 45 companies for a total of 355 plants for operating throughout the whole year without a single industrial injury. 397 plants owned by 46 firms were awarded these certificates of achievement for the same accomplishment during 1957.

According to the National Safety Council, this industry averages 3.38 injuries per million manhours, while the rate for all industry is 6.38.

And what is this phenomenal industry with such an astounding record? None other than the chemical industry; believe it or not!

At the risk of being accused of blowing our own bassoon, we take pride in the fact that Royce Chemical Company was one of three firms to whom special awards were made as having made the largest percentage improvement in safety methods and measures during the past year.

We will add to the award of the Manufacturing Chemists' Association our own small modicum of praise to our Royce safety engineer, Charlie Monks, even if he has run us flat-footed attending fire drills and emergency alarms. He is the enthusiast to outenthuse all enthusiasts. He is doing a job that would be hard to beat.

SIMPLIFICATION

Perusal of a recent number of the Journal of the Textile Institute brought back to mind a short memorandum we published two or three years ago, regarding the increasing tendency of our modern-day textile scientists and technicians to publish their findings, not in the "vulgar tongue" understandable by the rank and file of the industry, but in a newly created lingo known only to the initiated.

It does seem to us that the scientists of yesteryear spoke in such definite and clear terms that even the president of the company, a man generally possessed of a splendid education in the arts and in the humanities but frequently, alas, not versed in technology, could readily discern its meaning and application to his business. Some there are who would imply this practice to a species of snobbery. While we are not one of these, we would enjoin those who may realize that it is possible they may be erring in this direction, that they might profit by reading an article in that informative and well-edited publication, the Journal of the Society of Dyers and Colourists; it is entitled ". . . and inwardly digest", the author being S Burgess, who is a member of the Courtaulds Ltd organization at Droylsden.

He quotes part of a report on the mechanism of carpet soiling as follows:

> "Mechanisms of impingement and retention are operative in the soiling of textile fibers. By impingement, soil is brought into contact with the fiber through direct transfer and deposition as well as by inertial and diffusional movement of airborne soil." "The mechanisms of retention involve (a) macro-occlusion, or entrapment of particles in the intrayarn or interyarn spaces – filament denier size is a factor in interyarn entrapments and (b) micro-occlusion, or entrapment of particles in the irregularities of the fiber surface."

These two paragraphs, he translates as follows:

> "Carpets become soiled mainly because dirt is trodden into them, although some dirt may be air-borne."
> "The dirt lodges (a) within or between filaments or threads (yarn and filament deniers are factors which influence soiling, as they govern the available surface area) and (b) irregularities within the fiber surface. The cross-sectional shape of the fiber is important in the latter case."

To all of which we say "Amen" and again "Amen", being a firm believer in the policy of Technical Committee C of the Textile Institute, the editors of the latest edition of "Identification of Textile Materials". This policy is aptly described by Miss C E Jones, in an able editorial, thus, "Every effort has been made to steer a course between excessive simplicity and academic complexity."

Daniel B Moore has plenty to say on the matter of communications in an article "Language" which he read before the International College of Science at Milan, last spring. He points out the necessity of training technicians in the mill to interpret the findings of scientists, but he does not forget to remind the scientist of his duty to couch his reports in language that can be readily understood by the practical man.

It was at a meeting of Aslib, some years ago, that R S Hutton quoted this definition of the practical man: "A practical man has been defined as 'a man who practices the errors of his forefathers'." Nevertheless, it is to the practical man that we must entrust the carrying on of the industries of the country, and a surprisingly good job he does of it too. Let us not increase his difficulties by talking to him in a language he cannot comprehend.

May we suggest to the scientific worker that he discard the ABC of Abstruse, Bewildering, Complex, and adopt the ABC of Articulate, Brief, Clear.—Q.E.F.

TO SOLVE YOUR FINISHING PROBLEMS YOU NEED BOTH...

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The *successful* solution of a finishing problem always calls for two things: 1) Expert technical analysis; and 2) Products which meet the specific need with scientific precision. You get both from the Textile Finishes Department of Procter & Gamble. P&G offers you unsurpassed experience in solving finishing problems that require fatty based finishes and softeners, and in developing and manufacturing the needed soaps and detergents.

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For all the facts call the P&G Textile Representative nearest you. Or, if you prefer, write to Textile Finishes Section, Procter & Gamble, Industrial Specialty Sales Department, Cincinnati 1, Ohio.

New! PROXOFT-N

A remarkable new type of nonionic softener and lubricant. PROXOFT-N was developed by Procter & Gamble especially to give maximum stability with acids, salts and other trouble-making chemicals. It has the compatibility of the best nonionic agents and, at the same time, gives the desired lubricity and smooth, full-bodied softness which is characteristic of anionics. PROXOFT-N can be used advantageously on all types of natural and synthetic fibers.

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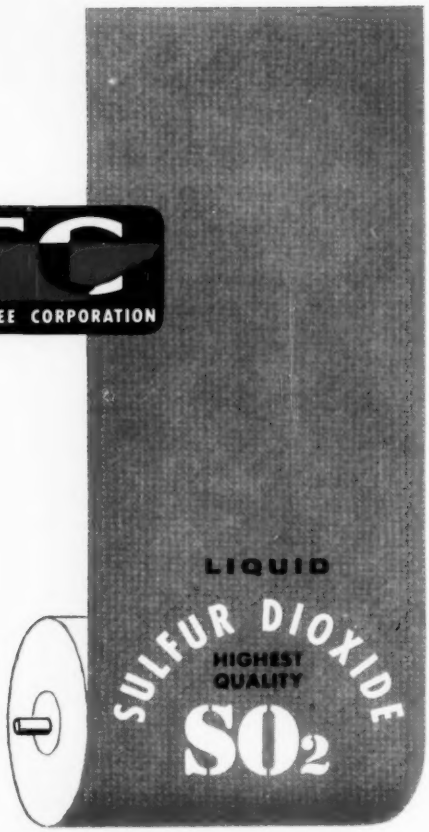
TC
TENNESSEE CORPORATION



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SO_2 accomplishes the following—Acidifies alkaline hypochlorite making it easier to wash out. Reduces chlorine to the harmless valence minus one (Cl^{-1})! Leaves fabric acid free.

Tennessee's Liquid Sulfur Dioxide is also very effective as a reducing, bleaching and neutralizing agent, and pH control.

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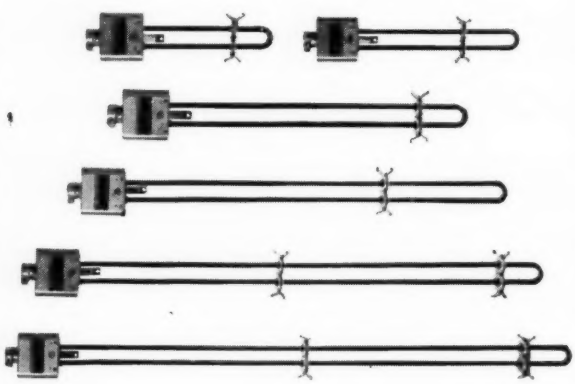
This Chromalox URAD heater lets you match your heat source to your work area. In one basic housing you can install up to 27 different heated lengths; each can be varied with the area of the work.



You can do-it-yourself too. Chromalox Far-Infrared elements are designed with a sliding fit that lets you interchange elements anywhere along the housing length. No more wasted heat when you go from one work size to another.

This versatility means real dollars and cents saving along with the built-in advantages of Chromalox Far-Infrared: metal-sheath, unbreakable element; infinitely variable output; high intensity, color-blind and uniform radiation.

Your Chromalox representative can give you detailed suggestions for the application of Chromalox adjustable Far-Infrared Heaters. Or, write us for a copy of Bulletin CS-607. 2623

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20th SOUTHERN TEXTILE EXPOSITION
October 6-10, 1958 . Textile Hall . Greenville, SC

THE 20th Southern Textile Exposition, to be held next month in Greenville, SC, will offer a wider variety of exhibits than ever before.

From a list of approximately 325 exhibitors we have selected the following, whose exhibits we believe will be of interest to those engaged chiefly in the textile wet-processing and testing fields of the industry.

Show hours will be from 9 am to 6 pm daily from October 6th through October 10th.

Information relative to tickets, room reservations, etc may be obtained by writing to Textile Hall Corp, Box 1323, Greenville, SC.

BIRCH BROTHERS, INC

32 Kent St
Somerville, Mass
Booth 248

On display: Model 1237 laboratory padder, new Model MF patented Supreme automatic grey room sewing machine, an improved version of the Coronation chain stitch piece end sewing machine, an entirely new and modern Supreme butt-seam railway sewing machine, and a Model 5 automatic cut-off winder.

In attendance: Clifford W Birch Jr, president; Richard Briggs, vice president; John C Cosby, Southern representative.

CLINTON CORN PROCESSING CO

A Division of Standard Brands Inc
Clinton, Iowa
Booth 205

Reception booth.

In attendance: A C Junge, R C Rau, C F Cline Jr, Grady Gilbert, Boyce Estes, Glenn Henderson, E F Patterson, R A Conzett, J A Tomlin.

CORN PRODUCTS SALES CO

1003 S C National Bank Bldg
Greenville, SC
Booth 445

Courtesy booth.

In attendance: A N McFarlane, A A Harden, H Plimpton, and M D Mullin, New York; J M Coe, Memphis; J R Hill, T W Blackwell, and David Jenkins, Atlanta; W R Joyner and Paul Donaghy Jr, Greensboro; H L Bailey, Charlotte; J Alden Simpson, Earl G King, Gordon E Wood, J M Adcock, and G O Greene, Greenville.

CROMPTON & KNOWLES CORP

Worcester, Mass
Booth 138

On display: Dyehouse cloth truck.

In attendance: F W Howe Jr, A Palmer, J F Molley, R S Schedin, J C Irvin, R A Sharpe, L Burgess, H C Wingard, V O Holcomb, and C Treadway.

THE EXACT WEIGHT SCALE CO

538 East Town St
Columbus 15, Ohio
Booth 208

On display: A new line of quality control and laboratory weighing instruments, including the Exact Weight Basic Weight Classifier, which is said to be capable of proving weight accuracies in the range of one part in 5,000 to one part in 20,000. This new instrument, which employs the Exact Weight Shadograph Scale, is equipped with photocell controls, which provide electronic signals and indicate correct weights, or over or under within preset limits. Any number of classifications from two to 128 reportedly may be used. Units are available to handle items in any shape or in a capacity range from 2000 milligrams up to 100 pounds.

The Basic Weight Classifier checkweighs, classifies by weight, and through electronic controls can operate signals, actuate mechanisms, control processing machines, and record data.

Exact Weight Shadograph Scales, with a high degree of fast visual accuracy, are said to be particularly adapted for color and quality control, yarn count, Micronaire testing, and Pressley-fractionation.

THE FOXBORO CO

Foxboro, Mass
Booth 176

On display: New instruments for recording cloth stretch and extremely low flow rates of textile processing fluids.

The stretch instrument, consisting of two Type 16 A pneumatic speed transmitters and a Model 54 Consotrol (pull out) Recorder, measures the speed of two rolls. Any difference in the two recorded speed measurements is a measure of cloth strength, as will be demonstrated at the Foxboro booth.

Also in operation will be the new 1/10-inch Foxboro Magnetic Flow Meter which is said to accurately measure difficult-to-meter fluids such as pigment dyes, hypochlorite, chlorine dioxide, hydrogen peroxide and starch solutions. Said to be especially useful in ratioing low flows, the meter reportedly will measure 0.1 gpm, full scale, with an overall accuracy of ±1.0 percent of scale.

In another demonstration, the Brookfield Viscometran viscometer will be shown with the Foxboro Dynalog Recorder, measuring the viscosity of typical liquids.

CycleLog Instruments will also be featured, including the Model 40 C-H Controller, which automatically duplicates time and temperature dyeing schedules; and the Model 40C-SD, which automatically controls a semi-decating machine to provide uniformity of cloth treatment.

Other instruments on display will include a Relative Humidity Recorder, a 13FA d/p Cell Transmitter for level measurements of viscous liquids such as size, and the Model 44 Temperature Transmitter. In addition, there will be a display of commonly used measuring elements such as a Redox cell, a conductivity cell, a Dewcel element and a pH assembly.

In attendance: W H Ridley, manager, Textile Industries Div, Foxboro, Mass; R M Glass, assistant manager, Textile Industries Div, Foxboro, Mass; T A Jones, sales engineer, Charlotte; E R Tims, sales engineer, Greenville; S C Alexander, branch manager, Charlotte; and F H Leathers and L L Hodges, sales engineers, Atlanta.

GASTON COUNTY DYEING MACHINE CO

Stanley, NC
Booth 846

Reception booth.

In attendance: G Hacker, W Newcomb, and R Craig.

DAVID GESSNER CO

Worcester 3, Mass
Booth 483

On display: 3-roll Hi-Torc Napper, Blend-Matic Naper Roll Grinder.

In attendance: Richard L Bernard, Richard C Franklin, John P Franklin, Richard A Herard, and Paul F Riedl.

HILLYARD CHEMICAL CO

302 North 4th St
St Joseph, Mo
Booths 305-6 Balcony

On display: Wood and concrete floor seals and finishes for textile mill maintenance, including Hillyard Super Hil-Crete resinous paint, which is said to be highly resistant to chemical used in drying operation.

In attendance: Wm A Schmaltz, sales manager.

THE HUBINGER CO

Keokuk, Iowa
Booth 501

On display: An actual demonstration of noncongealing properties of Hubinger's OK Brand Waxy XLT starches. This demonstration will operate at room temperature on a regular size formula. Samples of OK Brand starches will be shown, which are used in the printing, finishing, and weaving phases of the industry.

In attendance: Roy Underwood, bulk sales mgr; Ira L Griffin, Ira L Griffin Jr, William Griffin, and Garvis Orr, Southern textile agents; Joe Myers, Southeastern States mgr; Carl Merritt, technical sales representative; Jack Harnes, chief chemist; Lee Elizer, textile research and development chemist.

JAMES HUNTER, INC

Greenville, SC
Booth 474

On display: No/Lap reels for use in dye kettles, a product of James Hunter Machine Co; 3-bar Whirlaway ball-bearing expander, a product of Thomas Leyland Machinery Co of Readville, Mass.

THE INDUSTRIAL DRYER CORP

P O Box 850,
Stamford, Conn
Booths 469 & 470-A, Annex 7

On display: "The H-W" Conditioner, arranged to automatically preheat, condition, dry or exhaust for twist setting, shrinking, lofting, and regain.

In attendance: Philip H Friend, Southern representative; F W Caesar, vice president.

THE JOHNSON CORP

Three Rivers, Mich
Booth 441

On display: Self-supporting rotary pressure joints with assembly plates and syphon elbows, and valves.

In attendance: R W Gotscall, J E Dal Ponte

THE KEEVER STARCH CO

Textile Sales Div
118 South Pleasantburg Dr
Greenville, SC
Booth 407

Visitor's lounge.

In attendance: James F Kurtz and Charles C Sitzer, vice presidents; A S Fulford, secretary; F M Wallace, assistant mgr; Robert L High, research; R F Guill, C B Phillips, S S Rice, and T S Richbourg.

MACBETH CORP

P O Box 950
Newburgh, NY
Booth 113

On display: Industrial Skylight Model BBX-826 with color-matching booth. This unit, which is new in design, features a hand switch for switching from daylight to horizontal sunlight. Other accessories of interest to those concerned with color will be exhibited.

In attendance: Norman Macbeth, president; E F Slaughter, Slaughter Machinery Co, Charlotte, NC, Southern representative.

MARSHALL & WILLIAMS CORP

Providence, RI &
Greenville, SC
Booths 249-251

On display: A new type of winder, a light duty tenter frame, the Company's line of tenter clips, its range of drive units in sizes from 5 to 100 hp.

In attendance: Richmond Viall, president; John C Nash, vice president; Fred H Land, manager, James A Love, export manager; Albert J Marshall, Edward E Ford, William C Brown, and Fred Hyatt, sales engineers.

MONA INDUSTRIES, INC

Chemical Division
Paterson 4, NJ
Booth 514

On display: Monalit-Duplex Yarn Conditioning Machine and Monarc Yarn Conditioning Attachment for Abbot Automatic Quillers.

In attendance: R H Sommer, vice president, sales; R W Bailey, D C O'Hair, Charles G Stover, sales representatives.

MORTON SALT CO

110 North Wacker Dr
Chicago 6, Ill
Booth 512

On display: Kleer PCB Salt, Chemical Grade '999' Salt, Purex, and Kleer Coarse Rock Salt No. 1.

In attendance: B L Cribb, J M Culp, A C Dewey, A C Frick, J Mullinax, J B Neill, and E R Ravenel.

MOUNT HOPE MACHINERY CO

15 Fifth St
Taunton, Mass
Booth 114

On display: Mount Hope Skew Liner, an automatic skewed weft straightener; Floating Roll Guide, for alignment control; and the Automatic Tension Control.

In attendance: J D Robertson, president; J D Robertson Jr, manager, Skew Liner Dept; W M Gallahue, sales mgr; S A Moffitt, textile consultant; Alex Spears Jr, sales engineer; E P Slaughter, P H Slaughter, and Wright Macomson, sales representatives.

NATIONAL CARBON CO

Div of Union Carbide Corp
30 East 42nd St
New York, NY
Booth 39

On display: Impervious graphite equipment for handling the corrosive solution used in the processing and finishing of textiles. National Carbon Co will exhibit its complete line of Karbate imprevious graphite heat exchangers, pumps, valves, pipes and fittings. The display will emphasize versatility of Karbate impervious graphite in handling a wide range of corrosive solutions. which makes it possible for mills to standardize on the use of a single type of pump, for example for all corrosive solutions. In addition, the exhibit will point out the advantages of impervious graphite in eliminating contamination and discoloration of textiles in process.

In attendance: T W Manchester, Atlanta; H L Shepard, Lynchburg.

NATIONAL STARCH PRODUCTS INC

270 Madison Ave
New York 16, NY
Booth 459

On display: Samples of Cato, a cationic starch for warp sizing and finishing; Kofilm, an acetylated starch derivative for warp sizing; and Nu-Film, the sodium salt of an ungelatinized low substitute starch acid-ester derivative, for use in the sizing of cotton, spun rayon and various blended yarns.

Molecules of Cato, the first cationic starch for textiles, are positively charged and are said to exhibit adhesion for textile fibers which are negatively charged, especially the synthetics.

In attendance: J F Fitzgerald, vice president; L J Horan, manager, Southeastern Div; H C Olsen, supervisor, textile service; H M Smith, D Ray Lassiter, and C A Dyer, sales representatives.

JACQUES WOLF

Combination for Protection

...Against Gas Fading

Jacques Wolf's versatile Dileine and Meleine series of inhibitors offer you a complete range of gas fading protection in both the dyeing and finishing process.

For a positive guard against gas fading it will pay you to investigate the Dileine and Meleine series for superior results, greater selectivity, and ease of application. These versatile inhibitors can be *custom formulated* to meet your specific problems and plant conditions.

DILEINE for Dyeing—Eliminates predyeing operation and special preparation of goods. Dyeing may be carried out at high temperatures when Dileine and dyestuff are used simultaneously in dyebath.

MELEINE for Finishing—Applied in the finishing operation of box or jig dyed fabrics. Assures a supple hand on resin treated fabrics. Highly resistant to drycleaning and washing.

Write today for complete details and specifications. If you have a particular gas fading problem our technical department would welcome the opportunity of working with you towards a solution.

JACQUES WOLF & CO.
Chemicals PASSAIC, N.J.

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FASHION FINISHES!

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RESIN 909 Alykd Resin. Full Body & Drape. Medium Firm, Lustrous, No Mark Off — For Satin linings and blanket binding.

ACRYLO RESIN 90 Thermoplastic acrylic — Durable—Binder—Improved wear and abrasion resistance. Useful in WASH & WEAR formulae.

RESIN GUM Reacts with Formaldehyde Resins, producing Durable, Full Bodied, Resilient finish with improved tensile strength.

NYLON DETERGENT Dynamic Solvent, detergent & emulsifier action removes graphite, grease stains from nylon & synthetic fibers. Non-foaming.

All types of **THERMOSETTING & THERMOPLASTIC RESINS** are available to **MEET** your specific **END USES.**

SOFTENERS Resists discoloration by Heat & Light. NON IONIC—CATIONIC—ANIONIC

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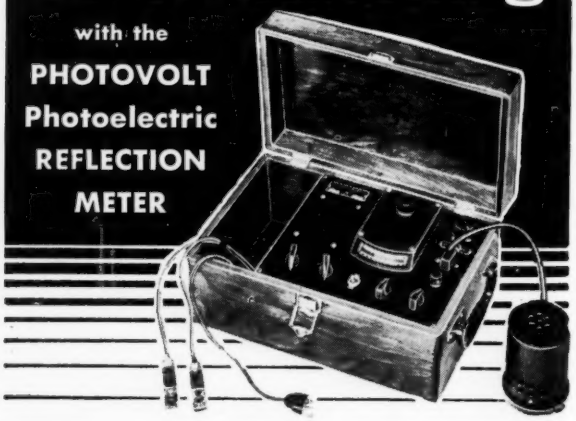

A truly practical precision instrument for color matching and for specifying color by tristimulus values, also for fading and detergency tests . . . for production control and laboratory work.

Portable, sturdy, simple to operate

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It's time you did! Last year cancer claimed the lives of 250,000 Americans; 75,000 of them lost their lives *needlessly* because they didn't know the facts of life about cancer. 800,000 Americans are alive today . . . cured of cancer . . . because they went to their doctors *in time*. They knew that a health checkup once a year is the best insurance against cancer. Make an appointment right now for a checkup . . . and make it a habit *for life*.

AMERICAN CANCER SOCIETY

NEMO INDUSTRIES, INC

3081 Maple Dr, NE
Atlanta 5, Ga
Booth 334

On display: The Nemo Jet Cooker will be in operation, as will an operating model of Nemo's modern mixing method. A movie of the Nemo Automatic Cutting Machine also will be shown.

In attendance: Norman E Elsas, Arthur C Kleiderer, and Francis E Rustin

THE POWERS REGULATOR CO

3400 Oakton St
Skokie, Ill
Booth 356

On display: Powers "Bubbler System" of size level control; static pressure regulator; indicating temperature control; diaphragm control valve.

In attendance: Earl R Bowman, advertising mgr, Skokie, Ill; R W Clark, product mgr, Skokie; Bill L Arbuckle, branch mgr, Charlotte; Churchill Carter, sales engr, Greenville; J J Slattery, sales engr, Columbia, SC; and B Vahorn, branch mgr, Greensboro.

PROCTOR & SCHWARTZ, INC

Seventh St & Tabor Rd
Philadelphia 20, Pa
Booth 262

On display: Photographs and information on the latest machinery developments and wet processing equipment.

In attendance: C W Schwartz 4th, sales manager, textile machinery; W H Poole, sales manager, textile finishing machinery; T A Mahan and J P Christ, Southern representatives.

ROBERT REINER INC

550-564 Gregory Ave
Weehawken, NJ
Booth 845

Reception booth.

In attendance: Walter Horn, H D Scheube.

PURITAN CHEMICAL CO

916-32 Ashby St, NW
Atlanta 18, Ga
Booth 446

On display: Covertamatic floor machine—a combination scrubbing-polishing, wet-dry pickup unit.

In attendance: T V Fisher, E P Collins, H P Hartley, B C Inabinet, C E Braun, H S Collinson, C S Shugart, G B Wright.

RIGGS AND LOMBARD, INC

Lowell, Mass
Booth 322

On display: Photos and descriptive literature of finishing machinery available from Riggs & Lombard, Cook Machine Co, and Parks & Woolson.

SCOTT TESTERS, INC

64 Blackstone St
Providence, RI
Booth 401

On display: the new "Model CRE", a new "user-design" tester for tensile evaluations from 0.1 to 1,000 lbs by the constant-rate-of-extension electric weighing technique, will be in full operation for the first time anywhere, with complete range of the various options, and numerous types of clamps, since all Scott clamps and holding fixtures are applicable to the CRE. The most radical single design feature of the CRE is the fact that the pulling stroke is upward, which has unusual advantages in operator convenience.

Other Scott equipment to be exhibited will be:

Model X-5 light duty tensile tester with capacity to 20 lbs equipped with Fletcher rubber-insert clamps. Originally designed for rubber thread testing, these clamps are today being used for testing high and low elongation synthetic yarns because their inserts provide a secure yet cushioned hold, rather than crushing the yarn.

Model B Internal Bond Tester for evaluating the internal bond strength of nonwoven materials by measuring the force required to split the material edgewise.

New A-8 Heavy Duty Fabric Clamp, capacity 2,000 lbs, designed for tensile testing of duck, webbing; laminated, coated and reinforced fabrics, etc.

Spruance Pneumatic Tire Cord Clamps, which make possible a semi-automatic test cycle, with improved precision of test and substantial savings in operator's time.

In attendance: Edwin H Benz, factory sales engineer; John E Hargreaves, general manager of Scott Testers (Southern) Inc; Southeastern sales and service representatives of Scott Testers.

SEYDEL-WOOLLEY & CO

748 Rice St, NW
Atlanta 18, Ga
Booth 238

On display: Improved Seyco warp lubricator; afterwaxing roll with new variable-speed drive including many added features; half-scale of the Niagara twist-setter yarn-conditioning machine; samples of various Seyco chemicals; technical bulletins concerning Seyco chemicals and Permachem, a permanent-type antiseptic finish.

In attendance: Vasser Woolley, president; John R Seydel, vice president; A W LaGrone, district sales mgr, Size Div; David Meriwether, sales mgr, Finishing Chemicals Div; E F Harrison, Francis B deLoach, Baxter Hemphill, V R Mills, W H Cutts, and W L Whisnant, technical representatives, Size Div; T Howard McCamy and R P Anthony Jr, technical representatives, Finishing Div.

SHELL OIL CO

50 West 50th St
New York 20, NY
Booth 103

On display: The newly developed line of Vexilla oils for textile machine lubrication.

In attendance: E J Colerick, K H Nonweiler, P Goddard, M S Treadway, G Potter, T Stevens, E L H Bastian, R C Hibbinbotham.

SONOCO PRODUCTS CO

Hartsville, SC
Booth 244

On display: Dye tubes, cones, spools, cores, bobbins and paper specialties; a complete line of folding boxes used in packaging.

In attendance: C B Harper, W M Carpenter, W K Lewis Jr, P F Williams, B H Biggs, W R Peacock, J E Tigner, H M Adams, C W White, and John A Reagan Jr.

A E STALEY MFG CO

Decatur, Ill
Booth 412—Annex 1

On display: The original art used in the preparation of the popular advertising series, "Weavers Through the Ages." A brief description of each illustration, as well as the historical background will be available in booklet form.

In attendance: L E Doxsie, asst mgr, Corn Div; E H Grosse, group leader, Applications Research Dept; F J Kekeisen, Southern regional sales mgr; W N Dulaney, mgr, Atlanta office; D A Barnes, technical service representative; H A Mitchell, textile supervisor; H H Ector, Crawford Garren, L J McCall, and B O Merritt Jr, technical representatives.

J E SIRRINE CO

Greenville, SC
Booth 204

Reception booth.

In attendance: R R Adams, A D Asbury, A S Bedell, F B Bozeman, J H Bringhurst Jr, L W Burdette, W L Carpenter, G W Cumbus, H S Forrester, H W Frederick, G C Gaskin, O F Going, C E Green, S M Hunter, W C Kendrick, C J Liles, Milton Lite, J T Mallard, F M Martin, H L McDonald, H W Meakin, I J Mikell, D G Moon, G R Morgan, W H Nardin, G P Patterson, A M Rickman, J L Robertson Jr, W A Robinson, L A Seaborn, J F Spellman, M M Stokely, H C Swannell, H H Watkins, C T Wise, and George Wrigley Jr.

TAYLOR INSTRUMENT COMPANIES

Rochester 1, NY
Booth 454

On display: a new line of electronic instruments for the textile industry, including the Taylor Potentiometer Transducer, along with a new electronic transmitter, and the latest advances in pneumatic instrumentation, including the Sensaire Temperature Transmitter. The line is said to embody the newest concepts in electronic instrument design, while incorporating many features originated by Taylor, such as front adjustment, plug-in components and rectilinear charts.

In attendance: H G Olson, L Van Huben from Rochester; J Barker and J E Burnett from Atlanta; H M Messanger, Charlotte; D G Warner, Greensboro; C H Miller, Richmond; and R S Peterson, Knoxville.

TEXIZE CHEMICALS, INC

P O Box 1820
Greenville, SC
Booth 430

Reception booth.

In attendance: W J Greer, president; W N Kline Jr, vice president & sales mgr, Textile Div; Carl M Chalmers, asst sales mgr, Textile Div; Joe A McNeill, technical representative, Textile Div; Walter M Greer, Ralph L Parker, and Clarence A Barrett, sales representatives, Textile Div; Tommy D Greer and C Herb Crews, Commercial Products Div.

TEXTILE SHOPS

P O Box 1330
Spartanburg, SC
Booth 115

Representing Manton-Gaulin Mfg Co, Inc (homogenizers).

In attendance: M Scharder, L Gregg, K Selden Jr, G Orr

WATSON & DESMOND

301½ W Fourth St
Charlotte, NC
Booth 128

Representing New England Paper Tube Co (paper dye and yarn tubes).

News of the Trade

National Adhesives Opens New Plant in Britain

A new plant for the polymerization of a wide range of polyvinyl acetate emulsions is now on stream at Slough, Bucks, England. Owned by National Starch Products, Inc, New York, the plant is operated by National Adhesives Ltd, a subsidiary.

According to A R G Williams, managing director of National Adhesives' British operations, the new plant will provide a center for research and technical service facilities for emulsion technology in Great Britain. At the same time it will encourage the free exchange of new developments in these fields between National's British technologists and the Company's research and development personnel in the United States. As such, the opening of the Slough plant marks a major expansion in National Adhesives' activities.

Williams stated that the new installation now makes available a complete line of polyvinyl acetate emulsions for shipment in bulk quantities to all areas of the British Isles, South Africa, Australia, New Zealand and the Continent. He explained that these products, which are based on standard and complex polymers, duplicate those which are currently being marketed by National Starch Products throughout the United States and Canada. In addition, the new Slough installation will also supply formulated resin emulsion adhesives for packaging applications.

Apponaug Roto-Graving Co Formed

The Apponaug Roto-Graving Co, formerly the photoengraving department of The Apponaug Finishing Co, was formed August 1st, with headquarters at 65 Centreville Rd, Apponaug, RI.

The new corporation has no affiliation with any printing company, but is engaged in the production of engraving copper rolls or cylinders for printers of textiles, plastics, foils, paper, and the packaging trade; specializing particularly in the photoengraved reproductions of continuous tone and continuous repeat color separation designs.

All personnel have been retained. Robert M Johnson, who has been affiliated with engraving at Apponaug for more than 20 years, is president, and Robert Powers, formerly associated with engraving at the Denison Mfg Co, is production manager.

NEW VAT COLOR KIT offered by the Vat Dye Institute contains all the elements necessary to conduct actual dyeing procedure in the classroom with fast vat colors. Designed to help students "learn by doing" through interesting teacher-student participation, the kit includes complete step-by-step instructions on how to use the contents to greatest advantage, lesson plans and teacher preparations suggestions, color identification and laundering procedures. Materials include glass beakers and rods, cloths for dyeing, vat dyes, "vatting" chemicals, and detergent. Packed in sturdy carrying case (17"x13"x5"), the kit is cost price at $15.00. Available from The Vat Dye Institute, Inc, 350 Fifth Avenue, New York 1, New York.

Marx Chairman of 7th CFC

The National Cotton Council has announced that Lawrence Marx Jr, president, National Association of Finishers of Textile Fabrics, will be general chairman of the seventh Annual Chemical Finishing Conference.

The conference, sponsored by the Council, will be held in Washington on October 1 and 2 at the Statler Hotel. Recent developments in finishes for wash and wear cottons will be the subject of a majority of the technical papers presented.

Mr Marx is also vice president and director of United Merchants and Manufacturers, Inc, and vice president of the Clearwater Finishing Co.

Session chairmen for the opening day of the conference are J David Reid, head, chemical finishing investigations, Southern Regional Research Laboratory, and Alfred E Brown, vice president, Harris Research Laboratory.

Session chairmen for the second day will be Arnold L Lippert, vice president and director of research, Joseph Bancroft and Sons Co; and John W Howard, staff member, utilization research division, National Cotton Council.

More than 300 textile scientists from private industry, educational institutions and government are expected to attend the meeting.

Ahco Expands, Relocates Technical Service Facilities

Changes involving expansion and relocation of major units of its technical service laboratories have been made public by Arnold, Hoffman & Co, Inc, Providence, RI. All Southern plants will henceforth be accommodated by Arnold, Hoffman's expanded Southern Area Laboratory, while Northern plants will be serviced by greatly enlarged laboratory facilities at Providence.

These changes, it is reported, are being effected at a considerable cost, but are necessitated by the current and developing trends of industries serviced by Arnold, Hoffman. In releasing this announcement, Raymond Thornton, the Company's technical service manager, states that the net result wil be an ability to render far more efficient service than hitherto for both Southern and Northern plants.

The Company's Teterboro, NJ, laboratory equipment and technical personnel have been transferred to and combined with those of the Providence laboratory. As a result of this action, the work capacity of the laboratories serving that area is increased considerably, and more efficient use can be made of specialized or standard equipment, it is stated. Considerably more working area has been made available at the Providence location, as has office space for technical administrative personnel.

The expansion of the Southern Area Laboratory at Ahco's Charlotte, NC, plant now enables that facility to handle continuous dyeing processes, textile printing, and resin and nonresin finishing, in addition to the usual routine services.

Of major importance is the recent addition of highly trained technical personnel to both areas.

Hatch

Hatch Marks 50th Anniversary

This September marks a special event in the career of one of New York's textile testers, Herbert H Hatch. Mr Hatch, president of Hatch Textile Research, Inc, is presently celebrating his fiftieth year in the textile industry.

In 1908, he entered his father's public textile adjusting business located in the old Wrigley Building at 192 West Broadway. Twelve years later, under his own name, Mr Hatch opened an adjustment office in the St Dennis Building at 799 Broadway. He recognized the need for higher standards of testing, and in 1926 the textile testing laboratory, Hatch & Reutinger, located at 160 Fifth Avenue, was established. A year later, the laboratory was relocated in the McCreery Building at 366 Fifth Avenue. Ten years hence, the partnership was dissolved and the name of Hatch Textile Research, Inc was adopted, with Mr Hatch as president. It is now located, and has been for the past nineteen years, at 25 East 26th Street. The laboratory handles many phases of textile testing and specializes in construction, wearability, "wash & wear", and quality control tests for all users and distributors.

His ambition to establish textile associations for the advancement of the trade has found Mr Hatch active in many organizations.

Astonized Finish Being Used on Dacron-Orlon Blends

Burlington Men's Wear Fabrics Co and Pacific Mills' Rhodiss Division are now applying Astonized antistatic finish to fabric blends of Dacron and Orlon. The finish, manufactured by Onyx Oil & Chemical Co, Jersey City, NJ, is being used in men's wear fabrics now being offered to the trade for the 1959 summer suiting season.

"Use of Aston by these two members of Burlington Industries, Inc, is consistent with our quality control licensing program begun last year," stated Samuel B McFarlane, Onyx vice president and technical director. This program covers use and promotion of Astonized durable antistatic finish in all segments of the women's, children's and men's wear fields.

AIEE Textile Conference

The American Institute of Electrical Engineers will hold its annual fall textile conference at North Carolina State College, Raleigh, Oct 30-31. It is sponsored by the Institute's Textile Subcommittee.

Eight papers on electrical engineering aspects of the textile industry will be presented. Howard E Strock is the Conference chairman. D Elmer Johnson, North Carolina State College, will address a luncheon during the Conference.

TDI Amends Membership Provisions

The Textile Distributors Institute, Inc has amended its membership provision for associate members to include any yarn producer, mill, dyer, printer and finisher, factor and banker.

Associate membership dues were set at $100 annually for dyers, printers and finishers, and $200 annually for all other interests.

Information may be obtained from Hilda A Wiedenfeld, executive director, Textile Distributors Institute, 469 Seventh Ave, New York 18, NY.

Carbide Doubles Acrylonitrile Capacity

Production capacity for acrylonitrile has been doubled at the Institute, W Va, plant of Union Carbide Chemicals Co, division of Union Carbide Corp.

Acrylic fibers are the largest consumers of acrylonitrile. Two new derivatives of acrylonitrile—dimethylamino propylamine and diethylamino propylamine—are used in the manufacture of softeners for rayon and cotton.

• NAMES IN THE NEWS •

Borghetty

General Aniline & Film Corp has announced the appointment of **Hector C Borghetty** to the position of general manager of foreign operations and that of **Francis Charles** as manager of the Linden, NJ plant. It was also announced that **Gerard E Neisser** has been named Latin American regional manager for the Company's foreign operations in addition to his present function as export-import manager of dyestuffs.

Mr Borghetty was formerly manager of textile development for Rohm & Haas Co of Philadelphia. Prior to that, he was manager of organic chemicals for General Dyestuff Corp from 1938 to 1951.

Mr Charles has been with GAF since 1950.

Edward C Diehl, formerly superintendent of dyeing and finishing at Ankokas Dyeing & Processing Co, Mt Holly, NJ, is now associated with Mid-West Processors, Inc, Libertyville, Ill, as general manager and plant superintendent.

Mr Diehl, who assumed his new post May 15th, had been with Ankokas Dyeing & Processing for 10 years. Prior to that time, he had been with Althouse Chemical Co and Fullerton Textiles.

Mr Diehl is a past chairman of the Delaware Valley Section, AATCC.

As previously noted, **H Bennett** and **E Rosendahl** have sold their interests in Glyco Products Co, Inc, which will be continued under the name of Glyco Chemicals Corp. Both will act in a consulting capacity to the Glyco Chemicals Corp.

Mr Bennett will continue as editor-in-chief of the *Chemical Formulary*. He left September 5 with a number of members of the Society of Cosmetic Chemists to attend various scientific symposia and visit the plants and laboratories of certain manufacturers in Italy, Germany, Denmark, Holland and Belgium.

Richard R Frey, formerly assistant secretary of the American Association of Textile Chemists and Colorists, is now serving as regional director of the Associated Industries of Massachusetts.

Shand

Esher

James E Shand has been appointed manager, chemical sales, and **John C Esher,** assistant manager, for the new Plastics and Coal Chemicals Division, Allied Chemical Corp.

Formerly assistant manager of chemical sales for Barrett Division, from which the new division was formed in July, Mr Shand joined Allied in 1946 as a technical representative for Barrett's chemical sales department.

Mr Esher was formerly assistant sales manager for chemical sales in charge of tar acids, tar bases, and other coal-tar chemicals.

Hennessey

Greenhall

Polymer Industries, Inc, Textile Chemicals Div, Springdale, Conn, has announced the appointment of **John H Hennessey Jr,** who will be engaged in field service as a technical advisor, and that of **Armand L Greenhall** to its laboratory staff.

Mr Hennessey was previously associated with The Aspinook Corp, with the printing division of Joseph Bancroft & Sons as a colorist, and with the Printed Fabrics Corp as technical advisor on table, hand, and automatic machine screen printing.

Mr Greenhall was formerly employed in the textile chemical division of Antara Chemicals, General Aniline & Film Corp.

Pact

Standard Chemical Products, Inc, Hoboken, NJ, has announced that **Arthur E Hirst,** for 18 years New England sales representative for the company, is retiring from active selling and will be succeeded by **Harry H Pact.**

Mr Pact has had wide experience in the textile dyeing and finishing industry, as well as in the sale of chemicals. His recent affiliations include Glyco Products Company, Inc, and E F Drew & Co.

John Cervini has been elected president and general manager of Pacific Textile Processing Company, Hermosa Beach, Calif, by the board of directors, effective September 2, 1958, to fill the vacancy created by the resignation of **W L Thompson.**

Mr Cervini was formerly manager of manufacturing at Cheney Bros, Manchester, Conn.

Joseph D Lowery has been appointed assistant general sales manager of the Industrial Chemicals Division, American Cyanamid Co.

A veteran of 36 years with Cyanamid, Mr Lowery was formerly the manager of the company's Heavy Chemicals Department. He has also held a variety of executive sales and administrative posts with the company.

Geigy Dyestuffs, Division of Geigy Chemical Corp, has announced the appointment of **J Vaughn Boone** as director of laboratories for the Charlotte, NC, operations of the Division.

Mr Boone has been employed in several hosiery mills and the Burlington Mills Corp, entering the employ of Geigy in 1941. For a number of years Mr Boone has served in the Technical Sales Department in the organization.

Mr Boone's duties involve the textile laboratories as well as the textile servicing of the Charlotte branch of Geigy Dyestuffs.